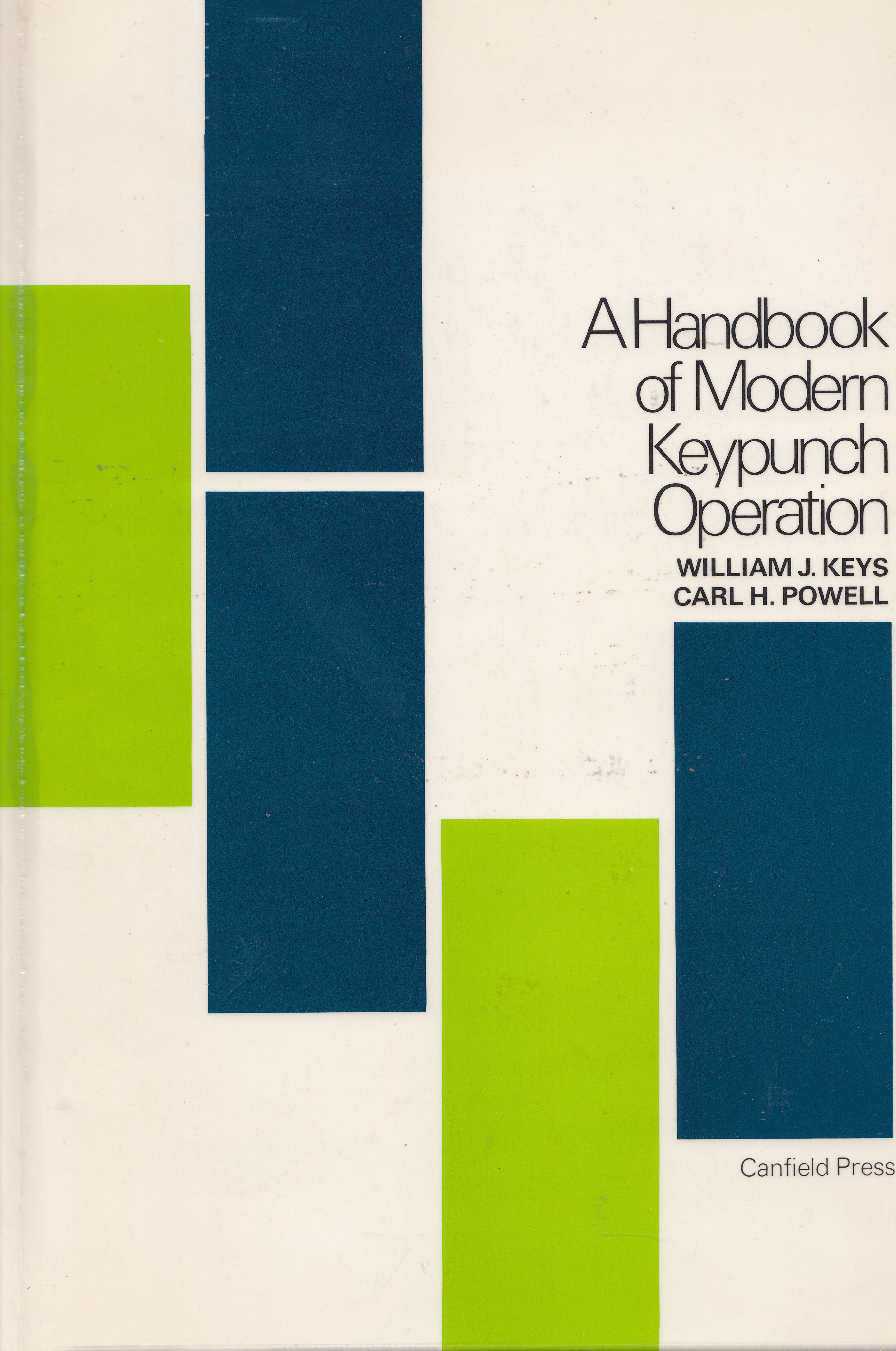

A Handbook of Modern Keypunch Operation

WILLIAM J. KEYS
CARL H. POWELL

Canfield Press

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WILLIAM J. KEYS
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Long Beach City College

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A Handbook
of Modern
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Operation

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PREFACE

It has only been in the last decade that students at the high school and junior college level have been given the opportunity to gain knowledge and skill in the basic concepts of data processing. Recently, the Federal government, leaders in the educational profession, and many progressive and concerned school boards have recognized that a need has arisen for the public to gain an understanding of data processing and to become aware of its impact on our society in the comparatively short period of time from the conception of Univac I, the first generally recognized business computer that was installed in 1955.

For quite some time many schools have been training students to be keypunch operators. Usually IBM 26 Keypunches have been utilized, with an IBM 56 Verifier as a possible addition to the program. Schools that have recently incorporated a keypunch program into their curriculum have felt the need to install IBM 29 Keypunches with an IBM 59 Verifier. Other schools have a combination of 26's and 29's. Because keypunch operators are hired on the basis of their punching speed and accuracy, other schools have installed Selectric typewriters to supplement their keypunch program.

There has been a lack of educational materials that meet the needs of the above-mentioned programs. Many students and teachers have found that training manuals do not adequately replace a textbook. Training manuals make excellent reference books but they are sadly lacking in simple step-by-step solutions, illustrations, and examples. No carefully designed problems or projects are furnished by a manual, so the conscientious teacher has had to spend many hours designing and producing them for classroom use.

The purpose of this textbook is to offer the high school and junior college student an easily understood, well-illustrated, and example-filled text that contains many step-by-step procedures in the operation of the keypunch. The following machines are studied in detail:

IBM 26 Keypunch
IBM 29 Keypunch
IBM Selectric Typewriter
IBM 56 Verifier
IBM 59 Verifier

An introduction to each of the following machines is given so that the student may also become familiar with some of the newer pieces of equipment that are currently being utilized by industry:

Mohawk Data-Recorder
Honeywell Keytape
IBM Model 50 Data Inscriber

Each chapter in this text consists of text material and review questions. The Appendix consists of many keypunching exercises that will provide experience in the punching of data cards (such as plant and equipment records and sales invoices). Also included in the Appendix are several computer programs, which are becoming more and more commonplace to the keypunch operator as an additional punching procedure.

Each page of the punching exercise indicates the length of time required to punch the exercise at 2000, 4000, 6000, and 8000 strokes per hour. Timed exercises are possible on any given page and the student will know exactly how fast she is punching on a daily basis.

Program control is discussed in complete detail and is well illustrated to aid the student in this most difficult concept. Step-by-step procedures to remove card jams, place a card on the program drum, correct an error card, duplicate a damaged card, ready a machine for punching, and replace the ribbon are illustrated.

All projects, exercises, and questions have been tested and proved successful in the keypunch-training program at Long Beach City College for high school and junior college students. It is the hope of the authors that this textbook will provide a comprehensive set of educational materials and exercises for developing an understanding of keypunch operation.

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William J. Keys
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INTRODUCTION chapter 1

THE KEYPUNCH OPERATOR

The preparation of punched cards is one of the most important steps in a data processing operation. Since the cards must be punched as rapidly and accurately as possible, the person responsible for their preparation must be reliable and conscientious (Fig. 1–1).

The machine used to punch holes into cards is called a *keypunch*. The keypunch

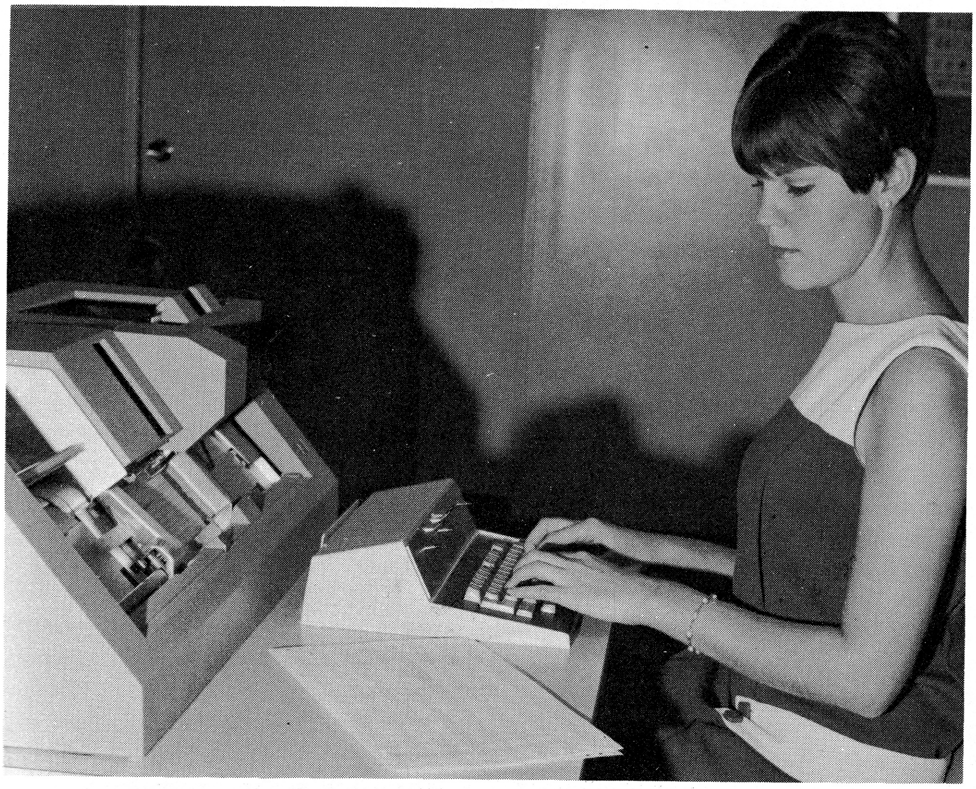


Fig. 1–1 Keypunch operator at work.

has a keyboard quite similar to that of a typewriter. When one of the keys is depressed a hole is punched on the card. The keypunch operator reads alphabetic and numeric information from a document and punches this information into cards in much the same manner that a typist prepares a printed report.

The employment requirements for a keypunch operator as found on many Civil Service job classification sheets usually include a high school diploma, the ability to type at least 35 words per minute, and the passing of an aptitude test that checks ability to read and record items of information quickly and accurately. The customary hiring age is usually between the ages of 18 and 35.

The traits of a good keypunch operator are as follows:

Good eyesight and finger dexterity
The ability to get along well with others
The ability to cooperate
The ability to accept supervision
The ability to follow oral and written instructions
The ability to concentrate on routine tasks

Keypunch jobs are available in such industries as insurance, aerospace, petroleum, public utilities, civil service, hospitals, and almost all areas of the business world. There has been a continuing demand for good keypunch operators because there has been a steadily increasing use of data processing equipment. The expansion of record-keeping needs of business and government should provide opportunities for keypunch operators for many years.

In seeking answers to many questions asked by her students regarding the employment possibilities for beginning keypunch operators, Miss Elaine Holzer, of the Regional Occupation Center, Torrance, Calif., conducted a survey of 100 firms in the Los Angeles area employing keypunch operators. Many of the questions and their corresponding answers are worth noting.

Question: What is the minimum age that you would hire a keypunch operator?

Sixty-four percent of the firms answering replied that they would hire a person 18 years of age.

Question: What type of education do you require for employment?

Eighty-four percent of the firms replying stated that the minimum amount of education required for employment was high school graduation.

Question: What is the starting salary for beginning keypunch operators?

Thirty-nine percent of the firms started a keypunch operator at a salary between $350 and $375 a month. Many of the businesses required previous experience; consequently, they had a higher starting salary.

Question: How much experience do you require of a beginning operator?

Thirty percent of the firms stated that they required 6 months to 1 year of experience. Twenty-one percent would hire operators with no previous experience. Many of the firms would substitute a keypunch training course for actual experience.

Question: How many keystrokes do you require the beginning operator to keypunch?

Twenty-three percent required the beginning operator to keypunch between 9,000 and 10,999 strokes per hour.

Twenty-one percent required between 4,001 and 5,999 strokes per hour. Many firms commented that faster speeds were required for numeric punching than for alphabetic. Many emphasized the importance of accuracy as well as speed.

Question: Do you give the operator a test?

Seventy-nine percent gave each applicant some type of test before employment. The test was not always the same, however. It was an actual keypunch stroke test, or an aptitude test, or in some cases a timed test in which the applicant would be given some cards to keypunch; a program card would be designed (one with alternate programming), punched, and utilized in the test.

Question: What machines must the keypunch operator know how to operate in addition to a keypunch?

Eighty-five percent wished their keypunch operators to be able to operate a verifier.

Question: Which keypunch machines do you use?

Many firms used more than one type of machine. Sixty-nine percent utilized the IBM 29 keypunch. Sixty-one percent used the 26 keypunch, and forty-four percent used the 24 keypunch.

Miss Holzer drew the following conclusions from this survey:

1. A high school education is required for employment.
2. Most firms will hire 18-year-olds.
3. Firms will hire a high school graduate who has completed a course in keypunch if she fulfills the other requirements of the position.
4. A wide range of stroking ability was indicated; stroking is not necessarily the basis for hiring applicants.
5. Most firms give applicants some type of test, either aptitude or punching.
6. Knowledge of the verifier is necessary.
7. The 29 keypunch is used by most firms, although many firms have the 24 or the 26 keypunch.

It is interesting to note the similarities between the qualifications as presented by the civil service job classifications and the requirements of private enterprise as shown through the survey. It appears evident, therefore, that opportunities in keypunching are available for those that have diligently prepared themselves for employment at the end of a recognized training course.

THE HISTORY OF PUNCHED CARD DATA PROCESSING

The development of punched card data processing can be attributed to the efforts of Dr. Herman Hollerith, a statistician for the United States Census Bureau during the late 1800s. A problem arose with the taking of the 1880 census that led to major developments in punched card data processing. The census information, or data, was handwritten on large cards that were sorted by hand into the proper classifications (such as home owner, occupation, and age). These cards were counted manually to obtain the necessary totals. After the cards had been sorted and counted by one classification, they were again sorted and counted until the census report was completed. It took over 7½ years to complete the 1880 census by this hand-sorting and hand-counting method; at that time the United States population was 50 million persons. At the rate the population was growing, it became evident that the manual method of taking the census was much too slow and that it would not be too many more years before the census would take longer to calculate than the required 10-year period. This proved to be a very grave and vital problem to the United States because the reallocation of seats in Congress every 10 years, as required by the Constitution, would be totally inaccurate.

By 1887 Dr. Hollerith had developed a mechanical system of recording, compiling, sorting, and tabulating the census data. The basic unit in the Hollerith system was the punched card. Each card recorded facts about an individual or a family. The card was divided into 240 separate squares, and each square was assigned a different classification. For example, a single hole punched in a particular square indicated the individual's number of years of education. Another hole in another square indicated that he was between 30 and 35 years old; another hole indicated the amount of his income; etc. The holes were punched into the card by means of a hand-operated punch. The cards were placed into a mechanical device that consisted of telescoping metal pins over cups of mercury. As the card was positioned beneath the pins, the square that had a hole punched in it would allow the metal pin to drop into the mercury. When this occurred, it completed an electrical circuit that caused a pointer to move one position on a dial.

Hollerith persuaded the city of Baltimore to test his punched card data processing machines when the city census was run in 1887. The Hollerith method was a success, and soon others tried the new system. The Bureau of Vital Statistics of New Jersey and the Board of Health of New York City were other early users of the punched card system.

Finally, in 1890, the United States Cenus Bureau used the Hollerith tabulating system and compiled the national census in 2½ years. The United States had grown to a total of 63 million persons. Over $5 million had been saved in tabulating the census, as well as years of time spent in counting the same information over and over again. Punched card data processing had proved to be a success. Soon the business world found that it, too, could use the new system, and two of the nation's largest railroads began to use punched card equipment.

By 1914 four basic punched card machines had been developed:

1. A keypunch, used for placing data into cards in the form of punched holes
2. A hand-operated gangpunch, used for punching the same information into several cards
3. A sorter, used for arranging cards into ascending or descending order
4. A tabulating machine, used for adding numbers and printing the results

In later years improvements were made on these machines, and others were added to perform other operations. See Fig. 1–2.

During the 1930s, "the largest accounting operation of all time" took place with the passage of the Social Security Act. Punched card data processing was utilized to set up accounts for 30 million people. At the end of 1 year the machines were handling more than 1 million records a day. During the next 20 years, over 100 million new accounts were added to the system.

During the war years of the 1940s, punched card data processing became more and more essential to the war effort. One of the many uses for punched card machines was initiated in 1942 with the passage by Congress of the Dependency

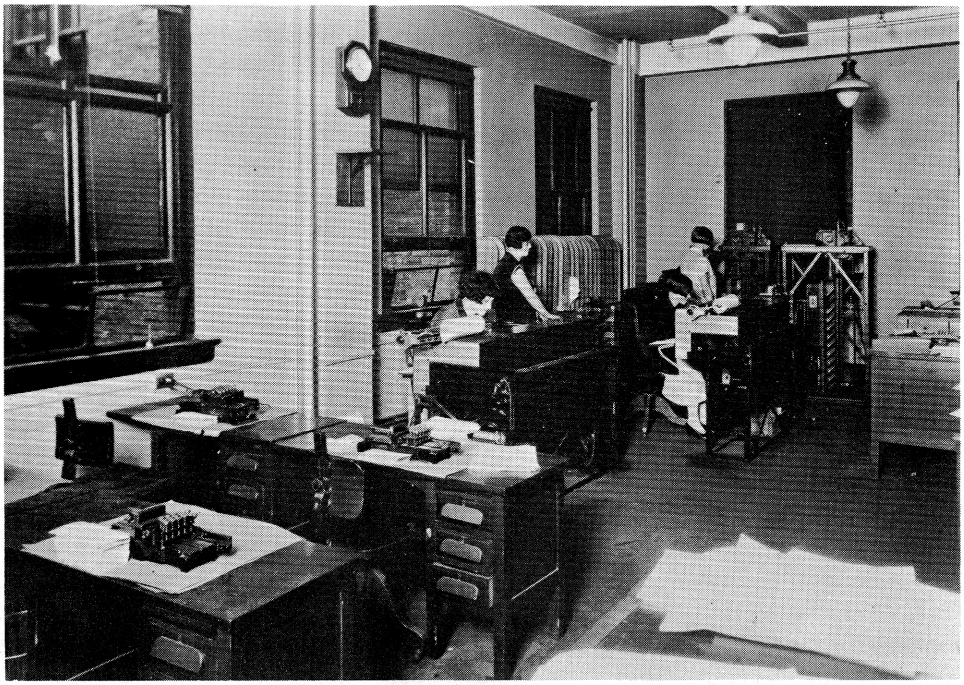


Fig. 1–2 Early punched card installation.

Law for allotments to wives and children of servicemen. Eight million checks each month, worth $500 million, were handled by punched card data processing machines. Mobile punched card data processing machines were used by United States troops at the war front. These mobile units became so important that in 1944 a German officer was captured with orders to bring in one of these units with all personnel alive.

During the 1950s, computers were used to handle the ever-growing mounds of paper work necessary to keep a modern-day business current with the times. These computers could handle much more information and turn out more reports in less time than data processing machines developed earlier.

Today computers use more than just punched cards to handle information. Magnetic tapes, telephone wires, and cathode-ray tubes are used to assist in the operation of thse modern-day computers, but in most cases the punched card is still the basic foundation for the handling of data.

THE MACHINES USED IN PUNCHED CARD DATA PROCESSING

After a card has been punched correctly from a source document such as a sales order, that card becomes a permanent *unit record* that may be processed by a variety of data processing machines, each designed to perform a specific function, usually by means of a wired control panel. This unit record is the basic unit of punched card accounting.

Several machines make up a typical punched card data processing system.

Keypunch

The method of recording data from a source document into punched cards is through the keypunch (Fig. 1–3). Keypunching is a method whereby the operator reads a source document and presses the keys of a keyboard to punch the data into

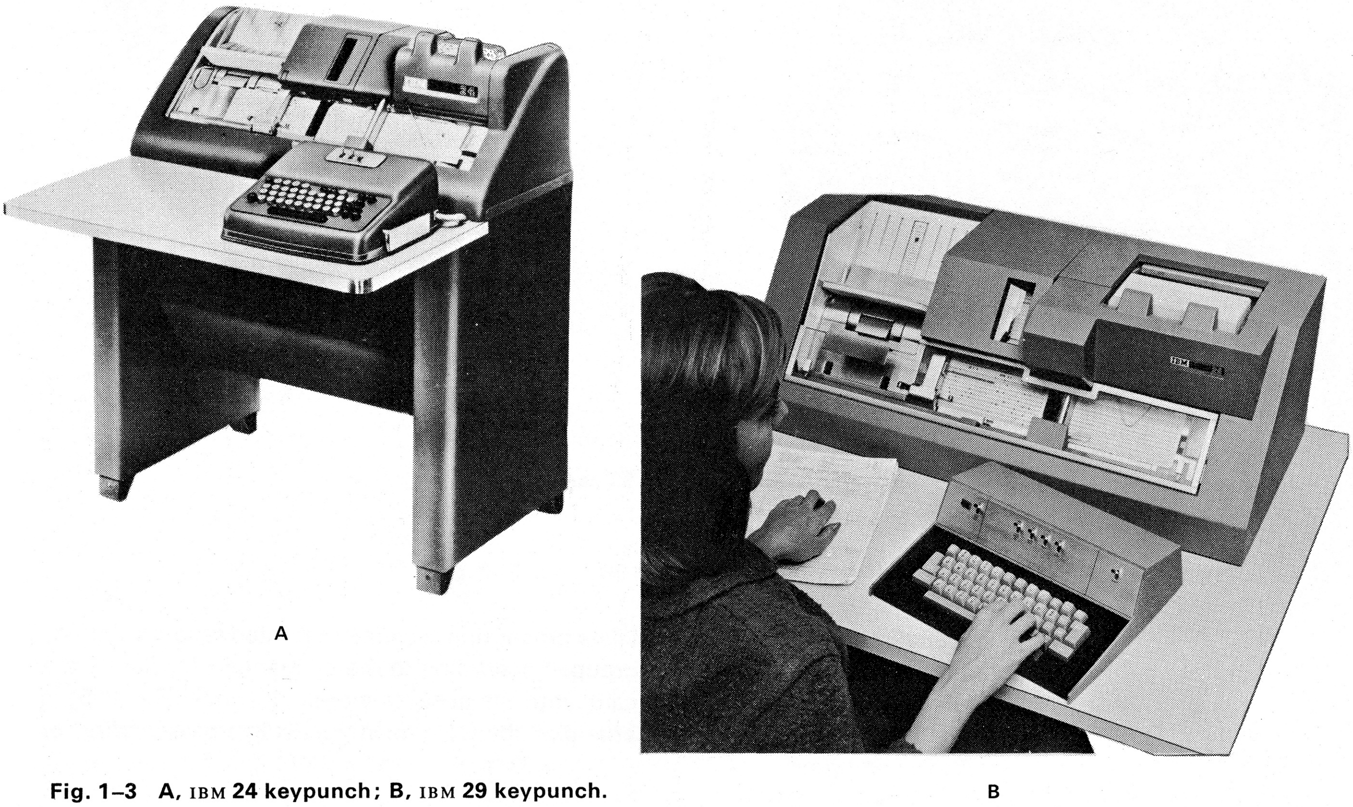


Fig. 1–3 A, IBM 24 keypunch; B, IBM 29 keypunch.

cards in the form of small rectangular holes. Some keypunches also have the ability to print data on the card. The operation of keypunching is similar to typing and is done on a keypunch (often called a *card punch*). Because other machines will use the information punched on these cards, it is extremely important that the cards be accurate.

Verifier

Information that is punched onto cards must be checked for accuracy by an operation called *verifying*. The source document and the keypunched cards go to the verifier operator, who places these cards in the verifier (Fig. 1–4), reads the source document, and depresses the keys of the verifier. Each key that is pressed is automatically compared with the hole already punched in the card, and any differences will cause the machine to stop.

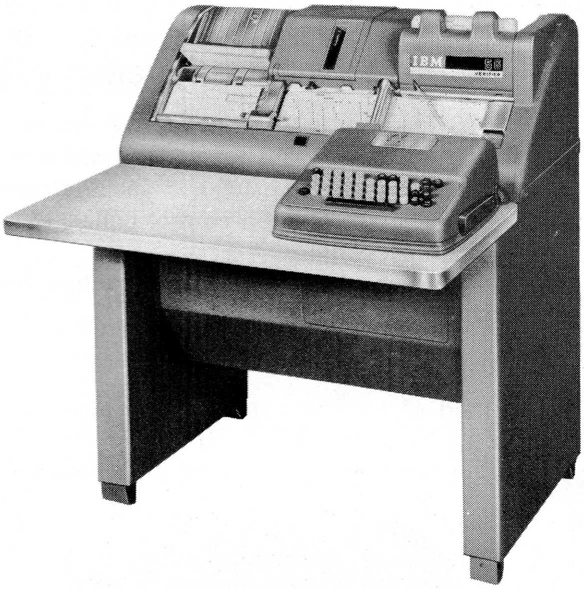


Fig. 1–4 IBM 56 verifier.

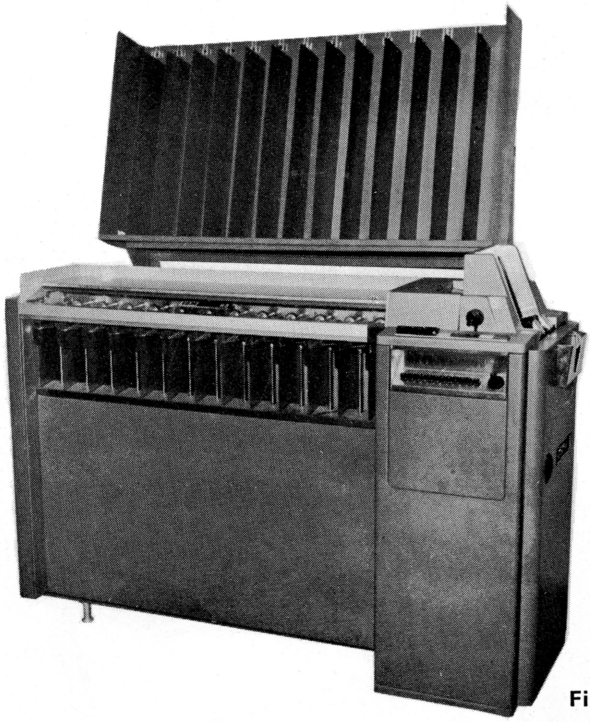


Fig. 1–5 IBM 83 card sorter.

Sorter

The final result of punched card data processing is usually a printed report. Information on these reports is usually grouped according to the sequence or order of the punched cards. To arrange the cards into the necessary order, a sorter (Fig. 1–5) is used. The sorter can arrange cards alphabetically or numerically, in ascending or descending order.

Accounting Machine

The accounting machine (Fig. 1–6) is used to produce the printed report. It also has the ability to add or subtract information that is punched onto cards. The accounting machine is usually considered to be the heart of the punched card data processing system. The *name tabulator,* sometimes shortened to *tab,* is another term for the accounting machine that is in general use.

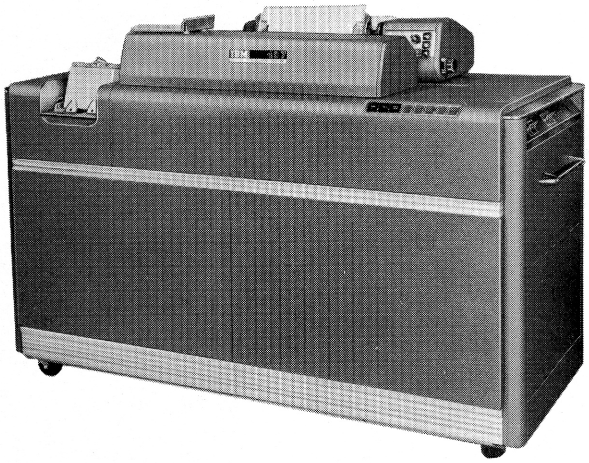


Fig. 1–6 IBM **407 accounting machine.**

Interpreter

The interpreter (Fig. 1–7) is used to print the letter, number, or special character that represents the punched hole on the card. Although a person trained in data processing can read the punched holes on a card, untrained people rely on printed characters.

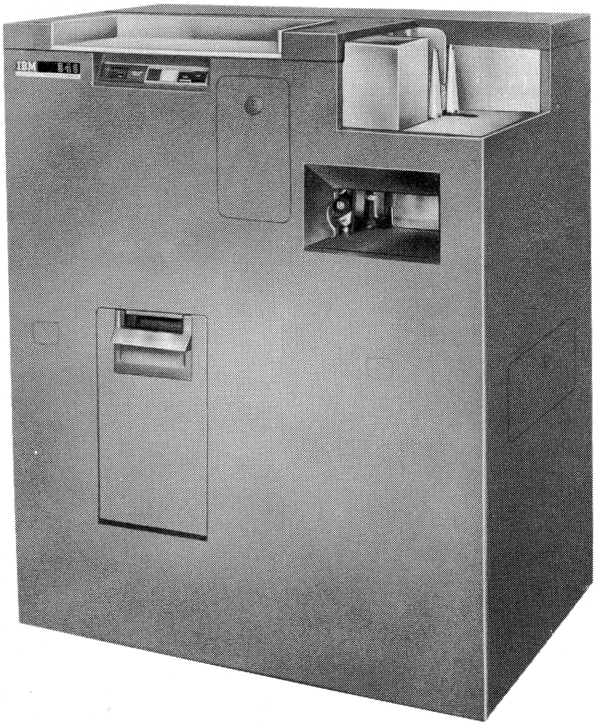


Fig. 1–7 IBM **548 interpreter.**

Reproducer

One of the functions of the reproducer is to duplicate or reproduce information from one card into another card. It is much faster to reproduce a file of cards than it is to keypunch a whole new file. Another function of the reproducer is *gangpunching,* an operation in which information from a single card is punched into a whole group or file of cards. See Fig. 1–8.

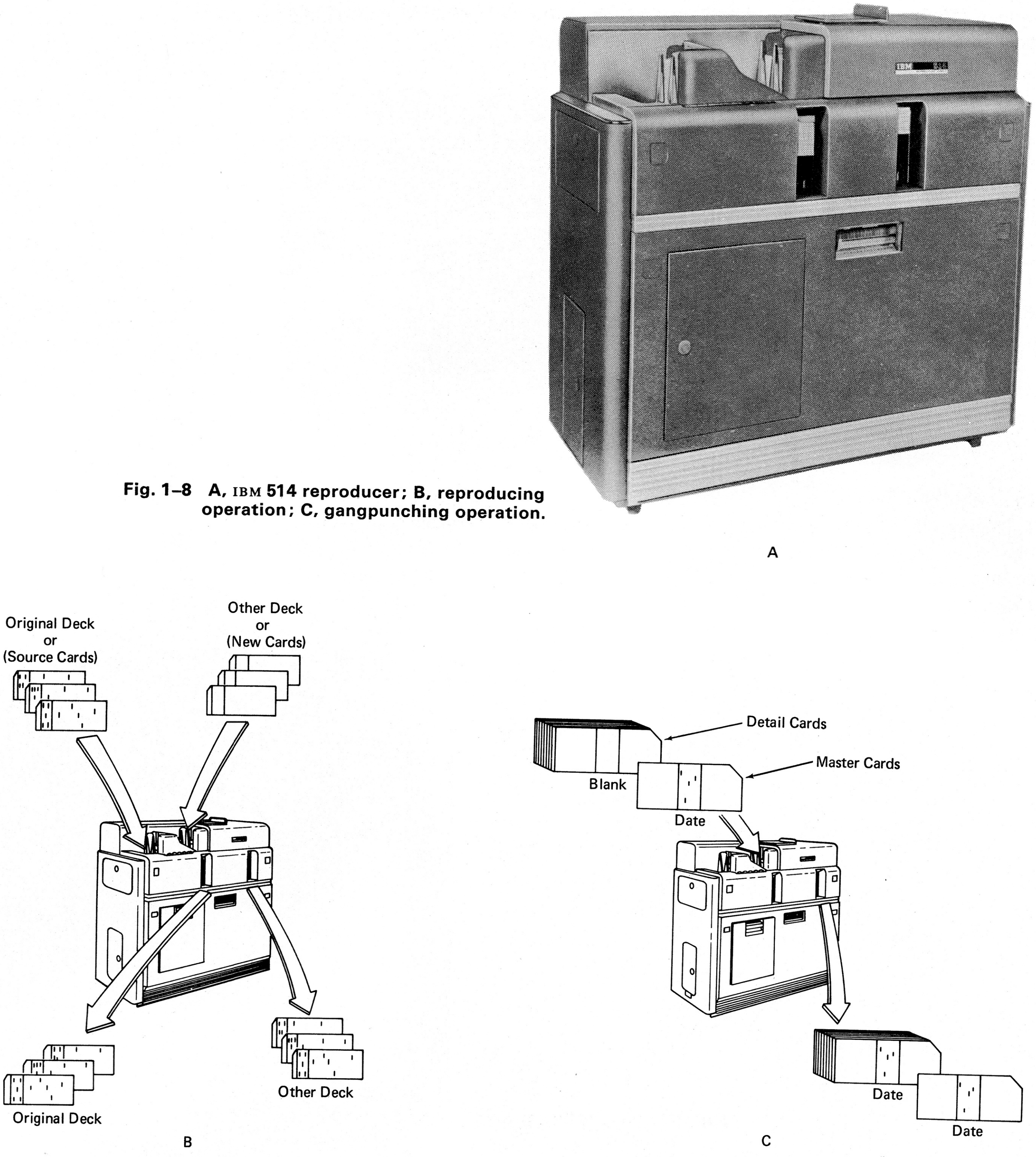

A
Original Deck
or
(Source Cards)
Other Deck
or
(New Cards)
Original Deck
Other Deck
B
Detail Cards
Master Cards
Blank
Date
Date
Date
C

Fig. 1–8 A, IBM 514 reproducer; B, reproducing operation; C, gangpunching operation.

Collator

The collator performs four basic functions of data processing. The first, *sequence checking,* is necessary to determine if files of cards are in a perfect ascending or descending order. If any cards are out of order, the collator can be wired to stop the operation and turn on an error light signaling that an error has been detected.

Another important function of the collator is *merging*, an operation in which two files of cards are combined into one file according to the ascending or descending order. For example, a customer name and address file could be merged with a file of customer purchase cards to send the customer a statement at the end of the month.

A third function of the collator is *matching.* A matching operation is quite similar to a merging operation except that instead of merging the two files into one the cards are compared but kept separate.

The last function of the collator is *selecting,* an operation in which certain cards are removed from the file and kept separate. These four functions may be performed alone or in combination with one another. For example, it would not be unusual to find the collator performing a merging-with-selection operation while sequence checking. See Fig. 1–9.

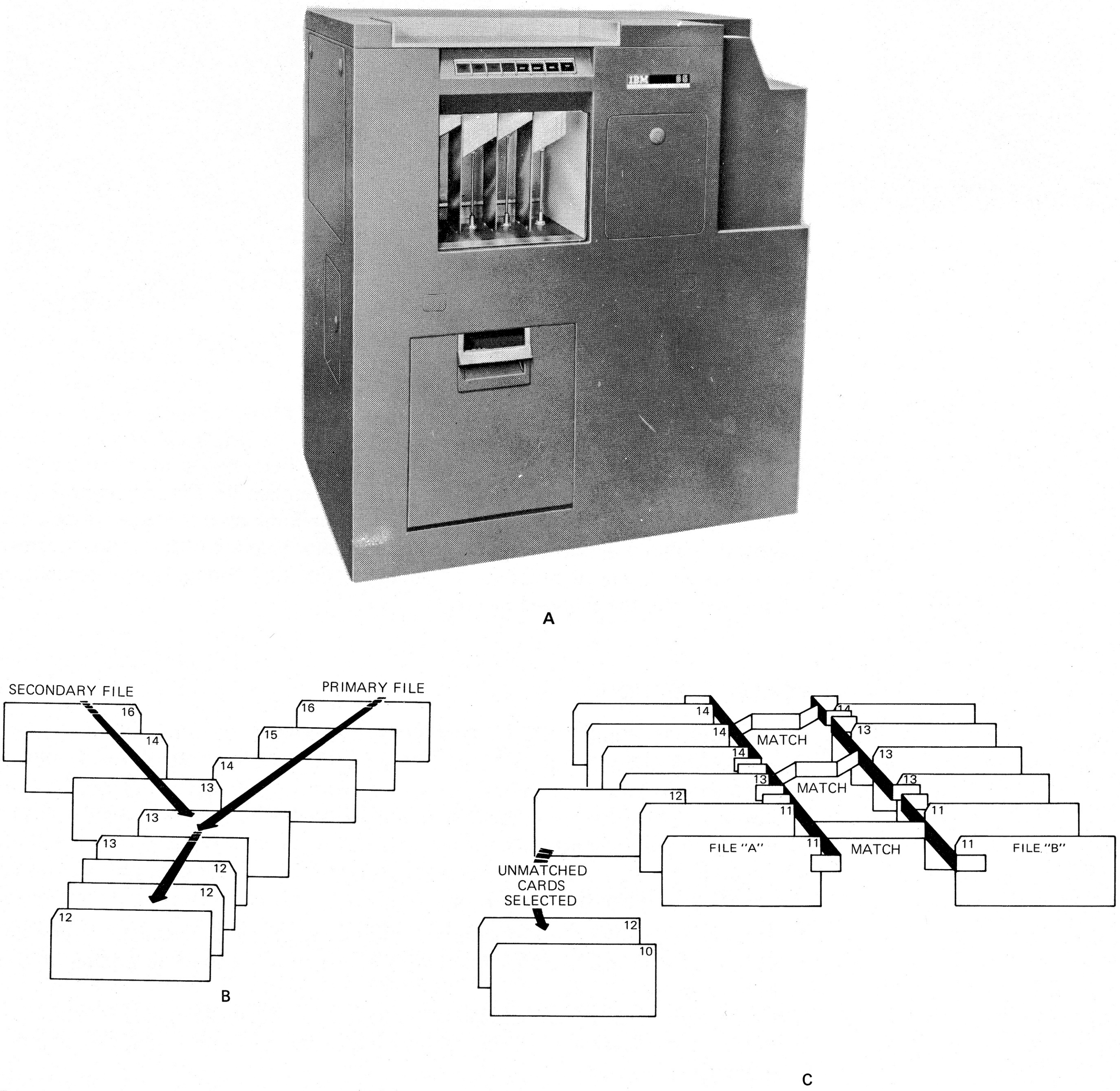

IBM 85
A
SECONDARY FILE
PRIMARY FILE
16
14
13
12
16
15
14
13
13
12
12
12
B
14
14
14
13
11
11
MATCH
MATCH
MATCH
14
13
13
13
11
11
12
FILE "A"
FILE "B"
UNMATCHED
CARDS
SELECTED
12
10
C

Fig. 1–9 A, IBM 85 collator; B, merging; C, matching.

Calculator

The calculator (Fig. 1–10) is used to perform mathematic calculations and to punch the results onto cards. It can add, subtract, multiply, and divide.

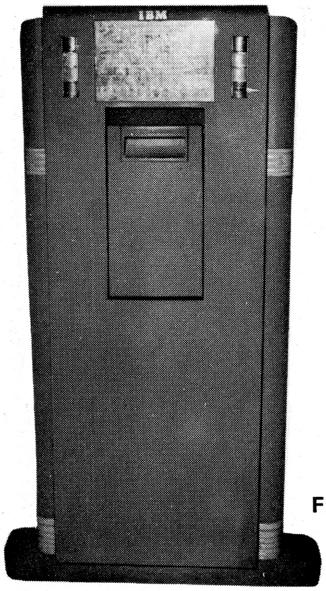


Fig. 1–10 IBM **604 calculator.**

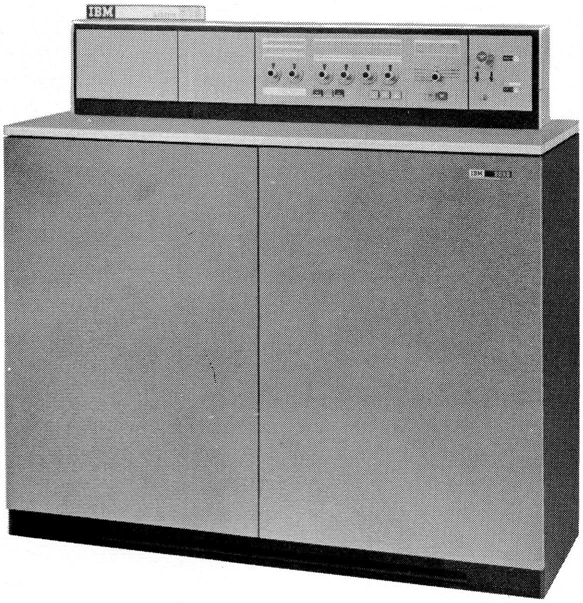


Fig. 1–11 IBM **360 computer.**

Electronic Computer

Many of today's modern computers utilize punched cards. One example is the IBM 360 Model 20 (Fig. 1–11). This computer eliminates the intermediate processing operations by consolidating into a single unit many of the functions discussed above. It has the ability to calculate, interpret, gangpunch, reproduce, collate, and print the required results.

REVIEW QUESTIONS

1. What are the requirements for operating a keypunch?
2. What effect did the United States Census Bureau have on the development of punched cards?
3. List nine types of punched card data processing machines and give the purpose of each.

RELATED ACTIVITIES

1. From the classified advertisements section of your local newspaper, locate the keypunch jobs that are available and bring them to class to be posted on the bulletin board.
2. Find out how many businesses in your community require keypunch operators.
3. Find various types of jobs that are available in data processing and describe the duties of each.

THE PUNCHED CARD chapter 2

Data processing machines have been used to reduce the huge amounts of paper work and to speed the business operation. As a business grows, its record-keeping problems also grow. If a business wishes to remain competitive, it must have complete and up-to-date facts with which to guide its decisions.

The punched card may be found in virtually every type of commercial, scientific, and governmental agency. Because of an ever-expanding need for more information obtained as quickly as possible, the various types of data processing machines were developed. Their main purpose is to process data (business or scientific information) and furnish some kind of report, for example, a sales report, a customer invoice, a purchase order, an inventory report, or a payroll check.

The advantage of punched card data processing over manual methods is that after the data have been punched onto cards, they may be used many times to produce a variety of reports. Because each card represents a single unit or transaction, punched card data processing is often referred to as the unit record concept of processing data.

THE IDENTIFICATION OF PUNCHED CARDS

The punched card itself (Fig. 2–1) measures 7$\frac{3}{8}$ by 3$\frac{3}{4}$ inches and is .007 (seven thousandths) of an inch thick. It is made from good-quality paper stock under a carefully controlled manufacturing process that ensures even thickness and weight.

There are two means of identifying punched cards: by color and by corner cut. Cards may be obtained in a variety of solid colors or with a stripe of color. For example, a payroll card could be red, a billing card blue, and an inventory card white with a green stripe. The corner cut is another means of visually identifying a type of card. Although any of the four corners may be cut, cards often have an upper-left- or upper-right-hand corner cut. The corner cut also ensures that all cards of the same type are facing the same direction or are right side up.

Punched card data processing machines can read special punches on cards called *control punches*; however, they cannot identify the type of card by color or corner cut.

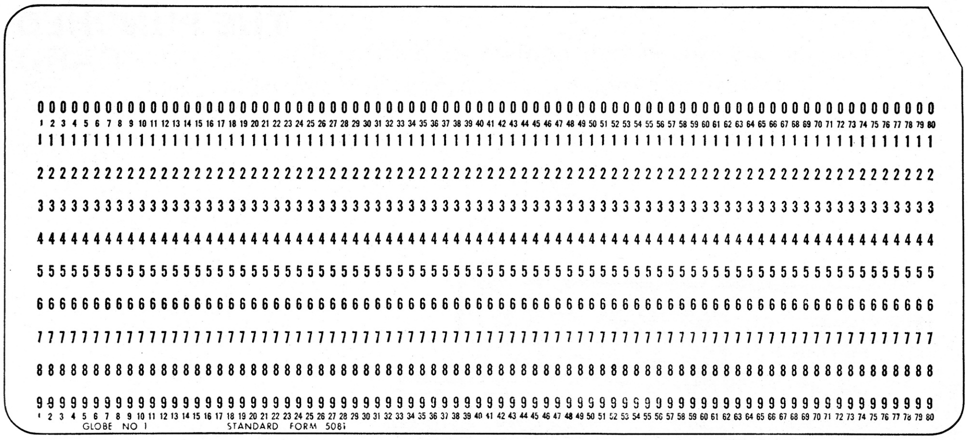

GLOBE NO 1
STANDARD FORM 5081

Fig. 2–1 Blank 5081 card.

THE HOLLERITH CODE

The punched card is divided into 80 vertical columns or *card columns.* Each card column may contain punching that represents a digit from 0 to 9, an alphabetic letter, or a special character such as @, &, #, $, or %. The card columns are numbered 1 to 80 across the face of the card. Horizontally the card is divided into 12 rows, which represent areas in which a punch may be placed. Usually the rows 0 to 9 are visually identified by being printed on the card. The top rows, the eleventh and twelfth rows, are not normally printed on the card, as this area is sometimes used for the printing of headings or interpreted information.

A punch that appears in one of the rows 0 to 9 is called a *numeric* punch.˙A punch that appears in row 12, 11, or 0 is referred to as a *zone* punch. It should be noted that either a numeric or a zone punch can appear in row 0. See Fig. 2–2 for an example of a punched card containing punches in all rows of card column 8—the digits 0 to 9 in card columns 15 through 24, the alphabet in columns 31 through 56, and some special characters in columns 63 through 73.

The top edge of the card is referred to as the *12 edge,* and the bottom edge, the *9 edge.* Cards are fed through the data processing machines either 12 edge first or 9 edge first. In some machines, the printed side of the cards must be facing up, called *face up.* In other machines the printed side of the card is placed down, *face down.* Proper reading of the cards is not possible unless the cards are placed in the machine correctly. The proper manner in which to insert the cards is indicated on most data processing machines; for example, cards are placed in the sorter 9 edge first, face down.

Numeric information is recorded on a card by punching a single hole in a card column. This hole will be placed in the numbered row that has the same number as

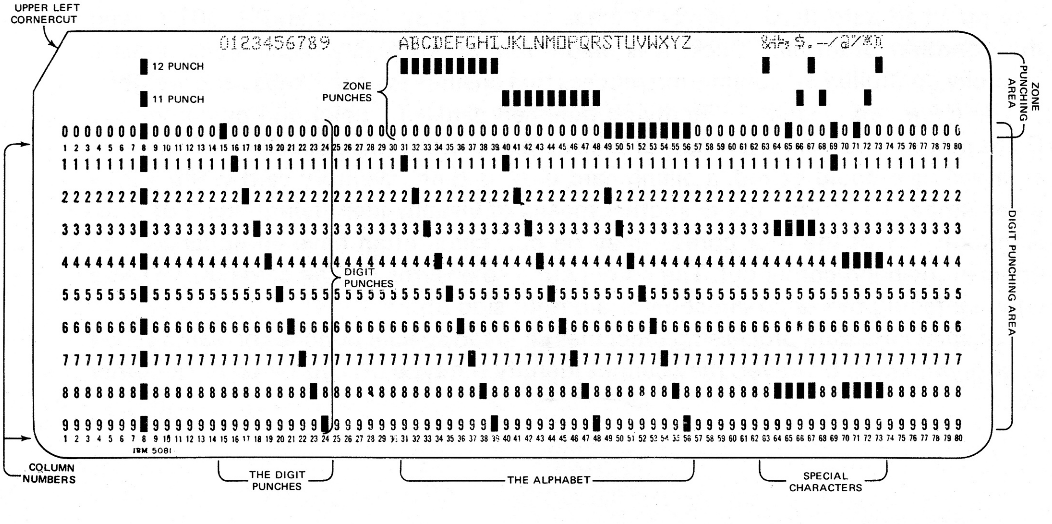

UPPER LEFT CORNERCUT
0123456789
ABCDEFGHIJKLMNOPQRSTUVWXYZ
&# $.-/@%*
12 PUNCH
11 PUNCH
ZONE PUNCHES
DIGIT PUNCHES
ZONE PUNCHING AREA
DIGIT PUNCHING AREA
IBM 5081
COLUMN NUMBERS
THE DIGIT PUNCHES
THE ALPHABET
SPECIAL CHARACTERS

Fig. 2–2 Punched card coding.

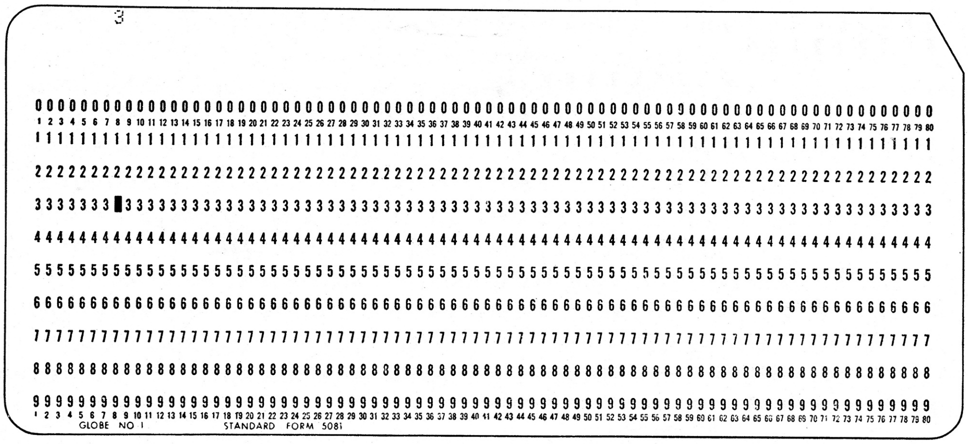


Fig. 2–3 **Numeric punching of the number 3 in card column 8.**

the digit that is to be recorded. If the number 3 is to be recorded in card column 8, for example, row 3 would be punched out in card column 8; see Fig. 2–3. Numbers larger than a single digit may be recorded by utilizing adjoining card columns; for example, if the number 750112 is to be punched in card columns 1 through 6, the card will be punched as follows:

Card column 1 will contain a punched hole in row 7.
Card column 2 will contain a punched hole in row 5.
Card column 3 will contain a punched hole in row 0.
Card column 4 will contain a punched hole in row 1.
Card column 5 will contain a punched hole in row 1.
Card column 6 will contain a punched hole in row 2.

See Fig. 2–4.

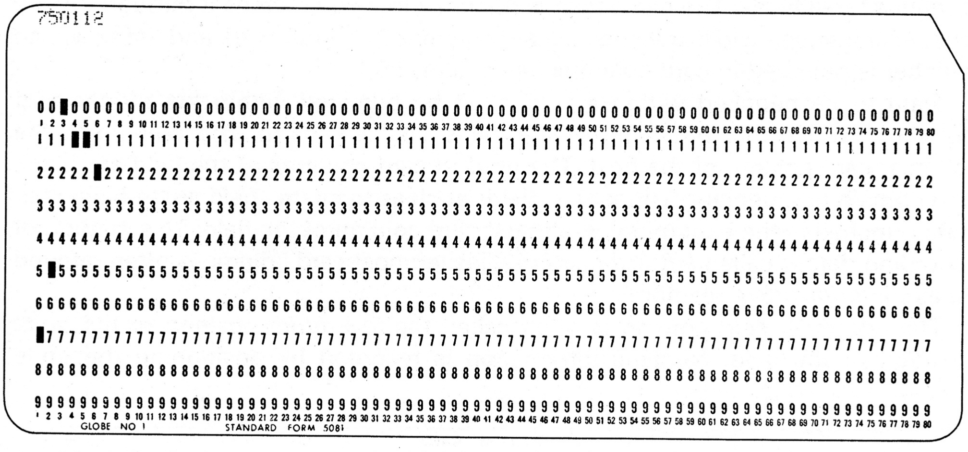


Fig. 2–4 **Numeric punching of the number 750112.**

Alphabetic information requires two punches in a card column for each letter. A numeric punch 1 through 9 is used with a zone punch 12, 11, or 0 for each of the 26 letters of the alphabet. The alphabet is coded as follows:

A	12 zone + 1	J	11 zone + 1	S	0 zone + 2
B	12 zone + 2	K	11 zone + 2	T	0 zone + 3
C	12 zone + 3	L	11 zone + 3	U	0 zone + 4
D	12 zone + 4	M	11 zone + 4	V	0 zone + 5
E	12 zone + 5	N	11 zone + 5	W	0 zone + 6
F	12 zone + 6	O	11 zone + 6	X	0 zone + 7
G	12 zone + 7	P	11 zone + 7	Y	0 zone + 8
H	12 zone + 8	Q	11 zone + 8	Z	0 zone + 9
I	12 zone + 9	R	11 zone + 9		

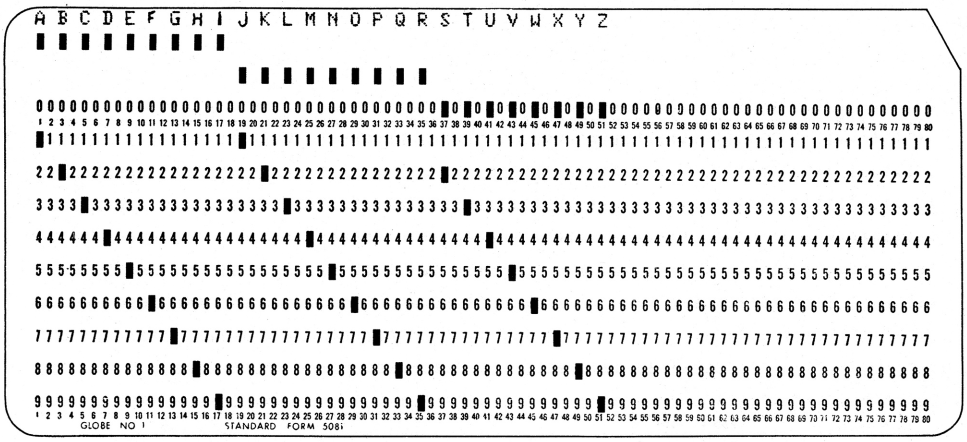


Fig. 2–5 Alphabetic coding.

The middle third of the alphabet is sometimes referred to as the *junior* row because it begins with J and ends with R. By remembering that an 11-zone punch is required with these letters, it is not too difficult to memorize the alphabet code. See Fig. 2–5 for alphabetic coding on a card.

Special characters are represented by one, two, or three punches in a card column.

CARD FIELDS

Card columns on a card that have been designed to contain specific information are called *fields.* A field may consist of a single column or a group of columns and may be numeric, alphabetic, or alphameric (a combination of alphabetic and numeric information, such as a street address). Figure 2–6 illustrates a punched card that contains three fields. The name field is punched in card columns 8 through 29, the customer number field is punched in card columns 39 through 43, and the salesman number is punched in card columns 54 through 56.

Data to be punched within a field must be punched within the proper card columns. Notice that punching of the name field begins in card column 8, the leftmost card column of the field. The unused card columns of the field are blank and contain no punching. Alphabetic fields such as the name field are to have their data punched in the beginning or leftmost card column of the field. This method of recording data is called *left justification.* This leftmost card column is often referred to as the *high-order* position.

The rightmost card column is often called the *low-order* position or the *units* position of the field. Numeric information is recorded by positioning the units

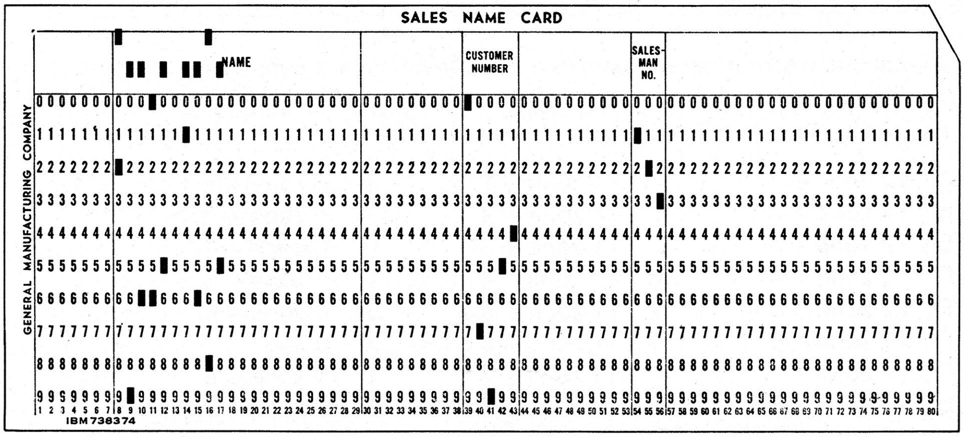


Fig. 2–6 Sales name card.

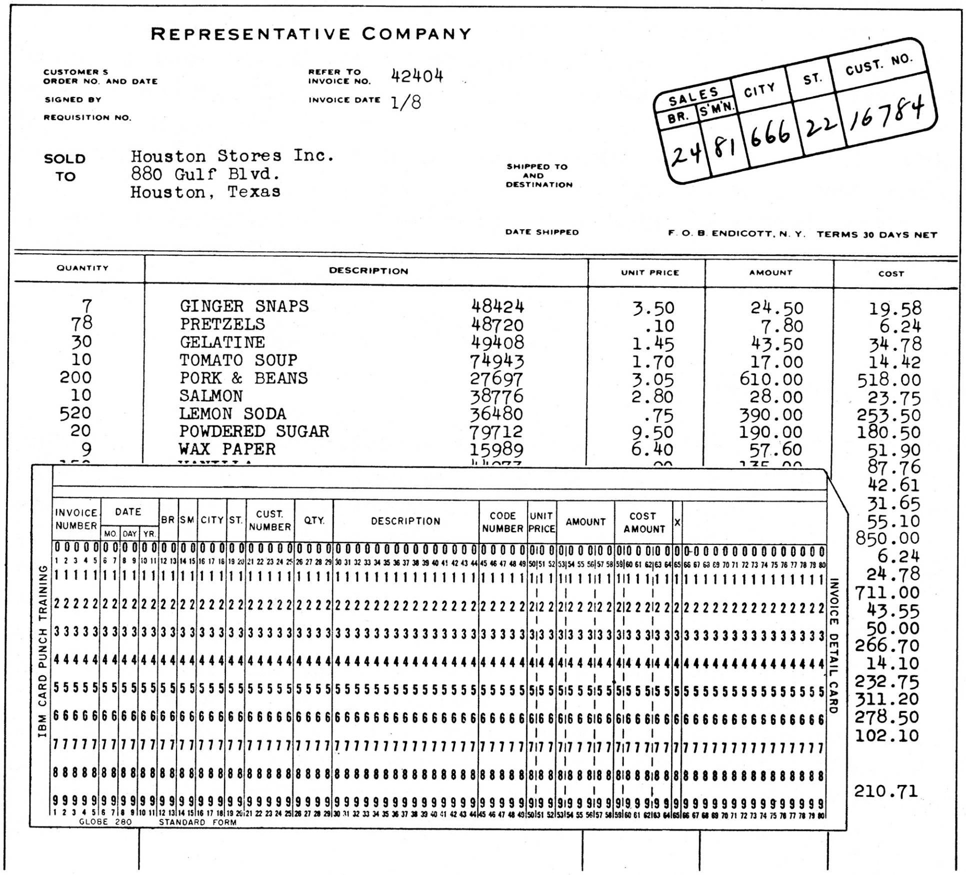
position of the number into the units position of the field. This method is referred to as *right justification.* If the number to be punched is not going to require all the card columns of the field, the number is positioned so that the units position of the number is in the units position of the field and the unneeded left-hand card columns are punched with zeros. In Fig. 2–6, the customer number is punched in card columns 39 through 43. The customer number recorded is 07954. When the 4 to be punched is placed in card column 43, card column 39 will need to contain a zero. Numeric fields always contain punching in every card column.

In review, it can be said that alphabetic information is left-justified, for punching begins in the high-order position of the field. Numeric information is right-justified, for the units digit of a number is punched in the low-order card column of the field. Unused card columns may appear blank in an alphabetic field, but a numeric field will contain either a number or a number preceded by leading zeros. Alphameric fields such as street addresses and telephone numbers are generally treated as alphabetic fields. They are left-justified and may contain blank columns.

THE DESIGN OF PUNCHED CARDS

Several factors should be considered when cards are designed:

1. *Report requirements.* When a card is to be created, the contents of the report must be considered.
2. *Availability of data.* Data to be punched on the card should be placed on the source document for the keypunch operator.
3. *Columns in other cards.* If the new card is to be used with other existing cards



REPRESENTATIVE COMPANY

CUSTOMER S ORDER NO. AND DATE
SIGNED BY
REQUISITION NO.

REFER TO INVOICE NO. 42404
INVOICE DATE 1/8

SALES BR.	SALES S'M'N.	CITY	ST.	CUST. NO.
24	81	666	22	16784

SOLD TO Houston Stores Inc.
880 Gulf Blvd.
Houston, Texas

SHIPPED TO AND DESTINATION

DATE SHIPPED

F. O. B. ENDICOTT, N. Y. TERMS 30 DAYS NET

QUANTITY	DESCRIPTION		UNIT PRICE	AMOUNT	COST
7	GINGER SNAPS	48424	3.50	24.50	19.58
78	PRETZELS	48720	.10	7.80	6.24
30	GELATINE	49408	1.45	43.50	34.78
10	TOMATO SOUP	74943	1.70	17.00	14.42
200	PORK & BEANS	27697	3.05	610.00	518.00
10	SALMON	38776	2.80	28.00	23.75
520	LEMON SODA	36480	.75	390.00	253.50
20	POWDERED SUGAR	79712	9.50	190.00	180.50
9	WAX PAPER	15989	6.40	57.60	51.90
					87.76
					42.61
					31.65
					55.10
					850.00
					6.24
					24.78
					711.00
					43.55
					50.00
					266.70
					14.10
					232.75
					311.20
					278.50
					102.10
					210.71

INVOICE NUMBER	DATE MO.	DATE DAY	DATE YR.	BR	SM	CITY	ST.	CUST. NUMBER	QTY.	DESCRIPTION	CODE NUMBER	UNIT PRICE	AMOUNT	COST AMOUNT	X

IBM CARD PUNCH TRAINING

INVOICE DETAIL CARD

GLOBE 280 STANDARD FORM

Fig. 2–7 Relationship of invoice and card.

in various jobs and will contain the same fields, the card fields on the new card should be placed in the same card columns as on the existing cards.

4. *Sequence of information on the source document.* The fields of a card should normally be arranged so that information from the source document can be read from left to right and top to bottom. Because the keypunch operator must create the punched card from the source document, the source document must be constructed so as to be read easily.
5. *Field length.* The length of a field should be large enough to handle the majority of applications. Only unusually large fields are handled by exception.
6. *Duplicated fields.* Fields to be duplicated are generally grouped together and placed at the left side of the card.
7. *Manually punched fields.* Manually punched fields should not be placed among fields to be duplicated. Alphabetic information affects the speed and accuracy of card punching when it is placed between numeric fields. Speed is lessened when the keypunch operator must change from numeric information to alphabetic and then back to numeric again.

Figure 2–7 illustrates a card designed from a sales invoice (a source document).

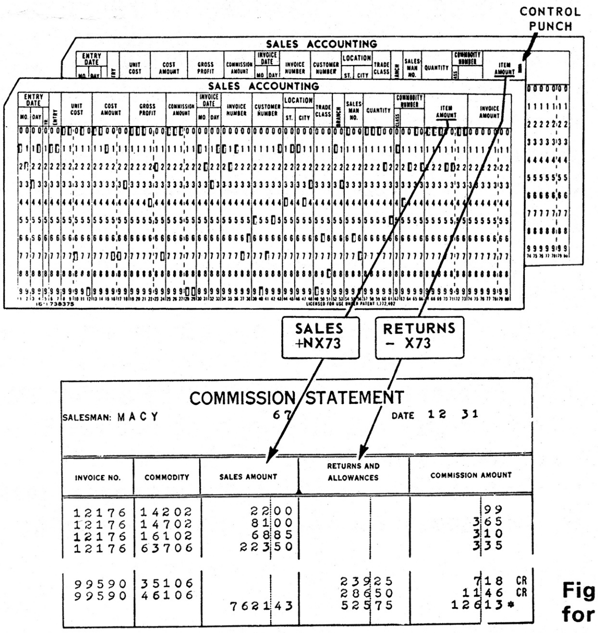
THE CODING OF DATA

Items of information placed in a punched card are called *data.* Sometimes the data to be punched in a card from a source document are written in lengthy descriptive form; if the data were punched exactly as on the source document, it would probably require more than the 80 columns on one card. The data are therefore coded so that they may be condensed and require as few card columns as possible. For example, a personnel card has a field assigned to handle such information as single male, married male, widowed male, and divorced male. Rather than have each category punched letter for letter using several card columns, a number can be assigned to each classification and this number is punched in a particular card column. If card column 21 were to contain this information for an unmarried male employee, a 1 punch in card column 21 could be punched. A 2 punch could represent the married male, a 3 punch the widowed male, etc.

The assignment of such codes has two purposes: It allows more efficient use of the card columns, and it permits data processing machines to arrange, control, and process the data faster. Usually the information to be coded is alphabetic in nature.

THE CONTROL PUNCH

Punched card equipment has the ability to recognize one type of card from another by means of a control punch. Usually the control punch is an 11-zone punch; however, a 12-zone punch can be used. When used as a control punch, the 11-zone is often referred to as an *X punch.* An X punch may appear in any card column by itself or in a card column containing a digit punch. The control punch is not placed in a card column that contains alphabetic punching because the letters of the alphabet A through R consist of an 11- or 12-zone punch as part of their normal alphabetic code-punching format. It should be noted that the X punch, when used as a control punch, should not be confused with the alphabetic letter X, which consists of a 0-zone punch and the digit 7 punch. Figure 2–8 illustrates one use of a control punch: the addition of cards that do not contain an X punch in card column 78 and the subtraction of those cards that do contain an X punch in card column 78. The cards used in Fig. 2–8 would be referred to as X78 or NX78 (no X punch in 78) cards.


CONTROL PUNCH
SALES ACCOUNTING
ENTRY DATE
UNIT COST
COST AMOUNT
GROSS PROFIT
COMMISSION AMOUNT
INVOICE DATE
INVOICE NUMBER
CUSTOMER NUMBER
LOCATION
TRADE CLASS
SALESMAN NO.
QUANTITY
COMMODITY NUMBER
ITEM AMOUNT
INVOICE AMOUNT
SALES +NX73
RETURNS - X73

COMMISSION STATEMENT

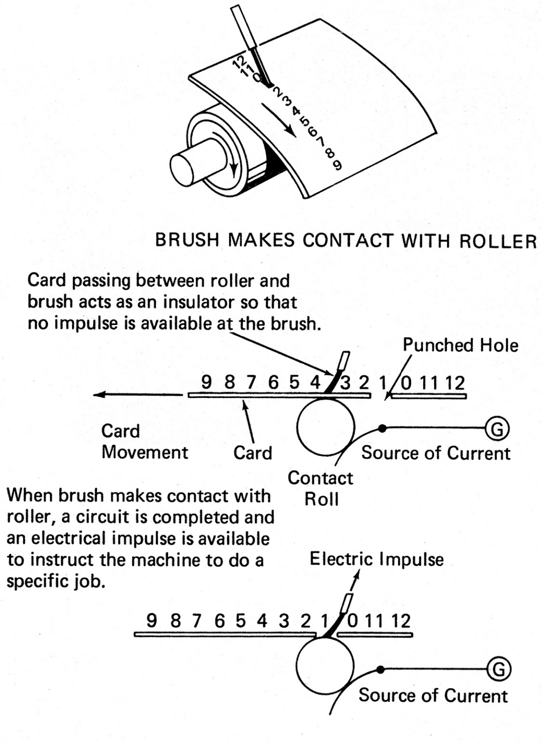
SALESMAN: M A C Y 67 DATE 12 31

INVOICE NO.	COMMODITY	SALES AMOUNT	RETURNS AND ALLOWANCES	COMMISSION AMOUNT
12176	14202	2200		99
12176	14702	8100		365
12176	16102	6885		310
12176	63706	22350		335
99590	35106		23925	718 CR
99590	46106		28650	1146 CR
		762143	52575	12613 *

Fig. 2–8 Use of X control punch for adding and subtracting.

CARD READING

Most data processing machines contain a wire brush or brushes that "read" the holes punched in a card. As a card moves through a machine, it passes between the brush and a metal roller carrying an electrical current. The card acts as an insulator that keeps the brush from touching the roller. When the hole is reached, the brush drops through the card and an electrical impulse is allowed to flow from the roller through the brush and is directed to activate some mechanism causing a specific function to occur. Some of these functions are adding, subtracting, sorting, printing, and punching. Most machines have 80 brushes, one for each card column, so that an entire card may be read as it passes through the machine. See Fig. 2–9.


12 11 0 1 2 3 4 5 6 7 8 9
BRUSH MAKES CONTACT WITH ROLLER
Punched Hole
9 8 7 6 5 4 3 2 1 0 11 12
Card Movement
Card
Source of Current
Contact Roll
Electric Impulse
9 8 7 6 5 4 3 2 1 0 11 12
Source of Current
G
G

Card passing between roller and brush acts as an insulator so that no impulse is available at the brush.

When brush makes contact with roller, a circuit is completed and an electrical impulse is available to instruct the machine to do a specific job.

Fig. 2–9 Sensing the punched hole.

THE CARE AND TREATMENT OF CARDS

Cards that have been mistreated will quite often be torn apart by a machine. Usually more than one card becomes involved before card feeding stops and each card must be replaced before the operation can be resumed. These card jams slow down production considerably and quite often can be prevented by proper handling and treatment of cards. The following rules should be practiced at all times to keep card jams to a minimum:

1. Rubber bands should be placed off-center or diagonally to avoid nicking the middle edges of a card.
2. Never use staples or paper clips on a card. Never spindle a card that is to run through a machine.
3. Cards with bent corners should be duplicated.
4. Never store cards in warm or damp areas. They may warp and not feed properly through the machines.
5. Cards should be stored tightly in boxes to prevent warping.
6. Cards should always be fanned and joggled prior to being fed into a machine.

FANNING AND JOGGLING

Static electricity may sometimes be created as cards are being handled, causing cards to stick together. This may be prevented by fanning the cards, a process similar to riffling the pages of a book.

Joggling is a process by which a deck of cards is aligned so that proper card feeding can occur. All machines have *joggle plates* for this purpose. Cards must always be joggled and fanned prior to being placed in a machine. See Fig. 2–10.

Cards that are slightly warped may sometimes be straightened by flexing them against the warp. Nicked or damaged cards must always be duplicated on the keypunch and replaced.

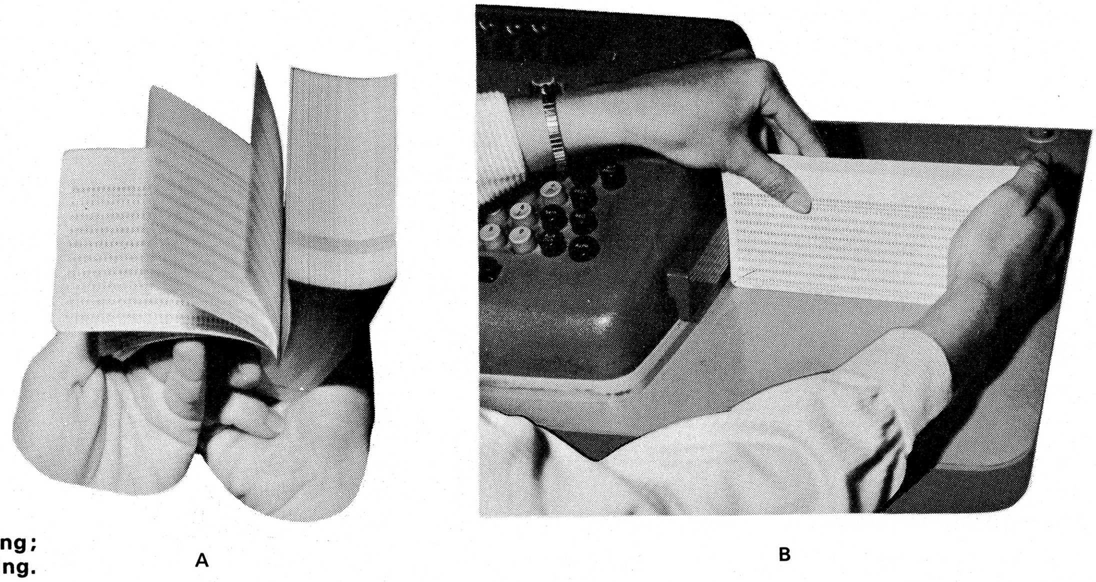


Fig. 2–10 A, Fanning; B, joggling.

REVIEW QUESTIONS

1. What is the advantage of punched card data processing over other methods of handling data?
2. Name two methods used in identifying cards.

3. How many card columns are there on a punched card?
4. How many rows are there on a punched card? List them.
5. How many punches in a card column represent a numeric character? An alphabetic character? A special character?
6. What is a field?
7. How is numeric data placed in a field? How is alphabetic data placed in a field?
8. What is the rightmost digit of a number called? What is the leftmost digit of a number called?
9. How are lengthy data coded?
10. What is an X control punch? How does it differ from the alphabetic punching for the letter X?
11. What are six important points to know in good card handling?
12. What should be done to cards before they are placed in any data processing machine?

RELATED ACTIVITIES

1. Find different types of punched cards that are being used by businesses in your area and bring them to class for posting on the bulletin board.

QUESTION CARDS

Figures 2–11 through 2–14 contain questions that are to be interpreted. Write the question and the answer to the question on a separate sheet of paper.

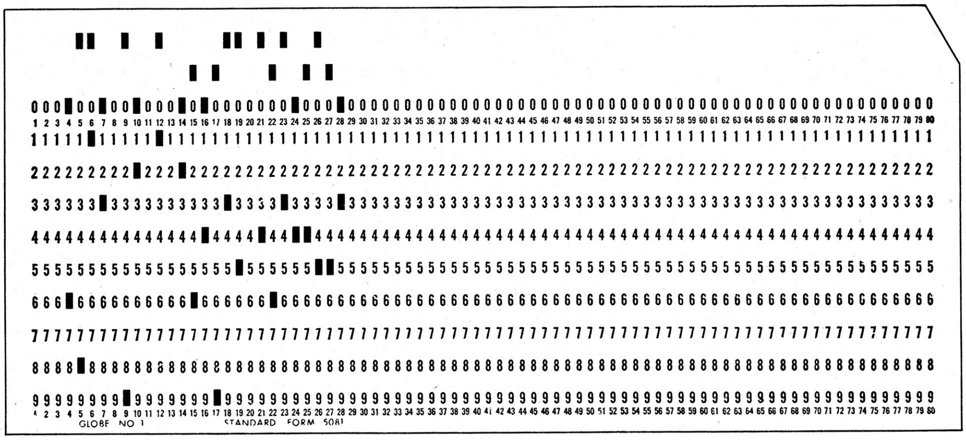


Fig. 2–11

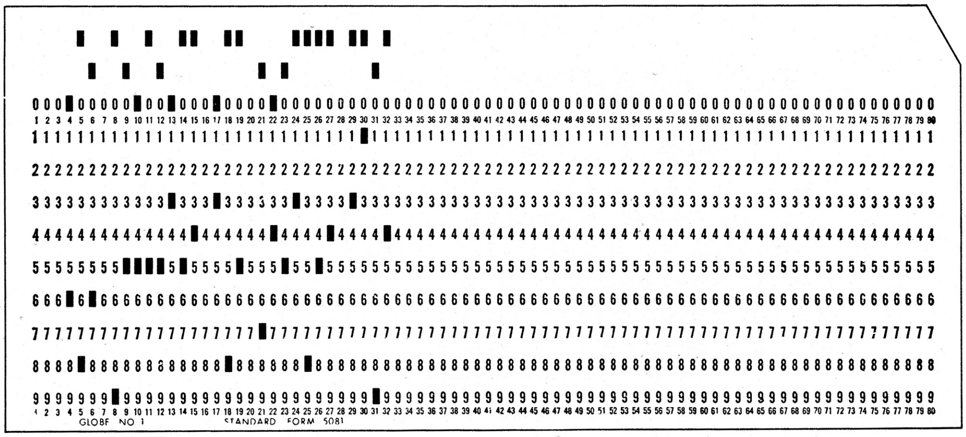


Fig. 2–12

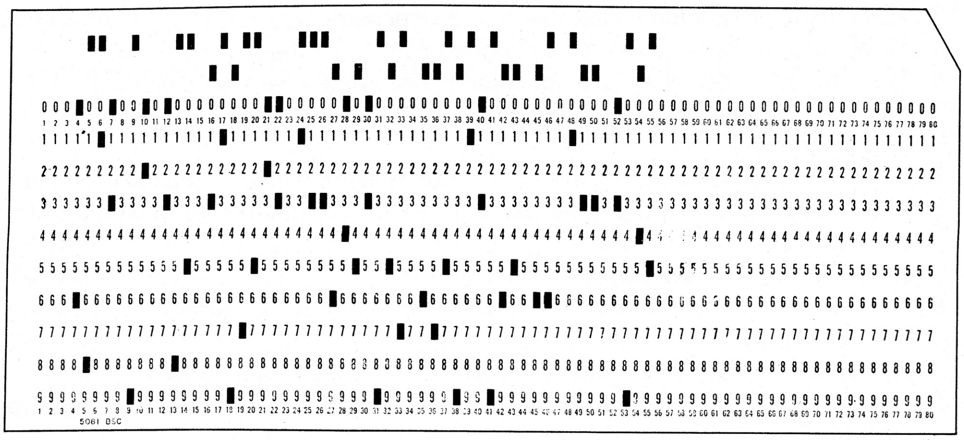


Fig. 2–13

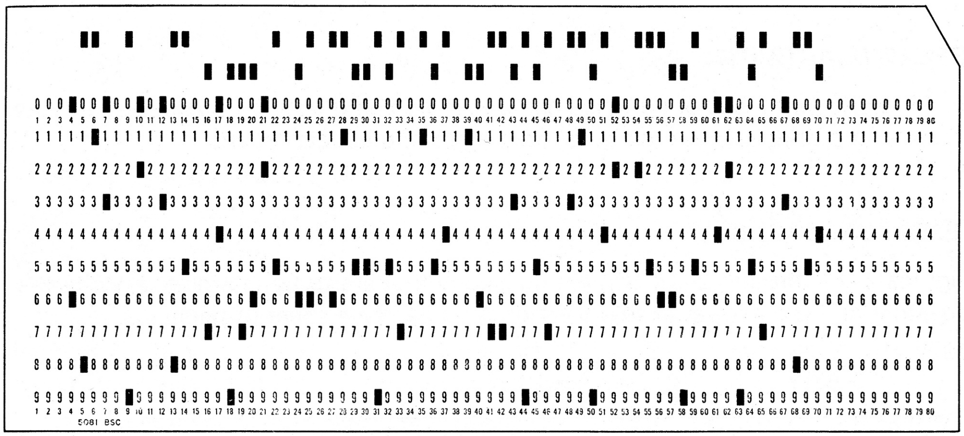


Fig. 2–14

COMPONENT PARTS OF THE KEYPUNCH chapter 3

OPERATING FEATURES OF THE 24 AND 26 KEYPUNCH

The first step in most data processing applications is to transform the data contained on the source document into punched holes on a card. This is most often accomplished by a card punch machine, usually called a keypunch. The keypunch is quite similar to a typewriter except that it punches holes in cards when the keys are depressed instead of printing on paper.

Keypunching and verifying are among the most important of all data processing machine operations. Correctly punched cards ensure that any reports to be prepared from them will be correct. Cards that are incorrectly punched with wrong data will cause needless time to be spent in obtaining the correct information and repunching the cards.

The three most common keypunch machines in use today are the IBM 24, 26, and 29 keypunches. The 24 and 26 are essentially the same in design, features, and operation. The major difference between the two is the additional feature of a print unit on the 26. This printing mechanism allows for the printing of data on the card at the same time the card is being punched. Figure 3–1 pictures the 26 keypunch with operation features indicated. The 29 keypunch utilizes many of the features of the 26 and is discussed in the next section.

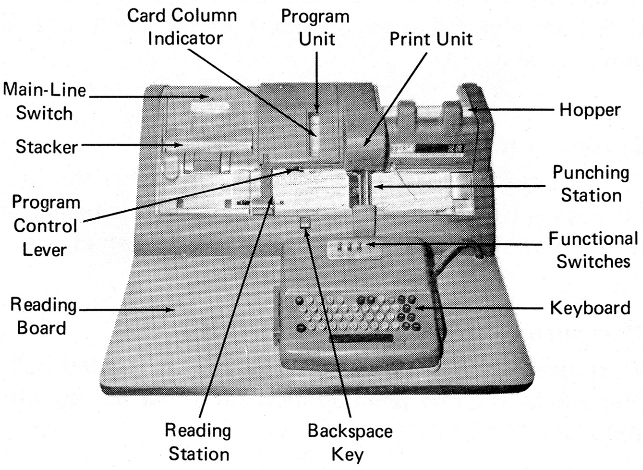

Card Column Indicator
Program Unit
Print Unit
Main-Line Switch
Hopper
Stacker
Punching Station
Program Control Lever
Functional Switches
Reading Board
Keyboard
Reading Station
Backspace Key

Fig. 3–1 IBM **26 keypunch.**

Hopper

The hopper is located at the upper-right-hand corner of the keypunch. It holds approximately 500 cards, which are placed into the hopper face forward, 9 edge down. The hopper is used when card volume is large and automatic card feeding is desired. Cards move from the hopper to the punching station.

Punching Station

The punching station is located directly beneath the hopper. The punching station contains 12 punching dies, one for each row on the card. As each punching key on the keyboard is depressed, the proper punch dies become active and punching occurs on the card.

Reading Station

The reading station is found to the left of the punching station. After the card has been punched, it moves to the reading station. The reading station contains a contact roll and 12 reading brushes, one for each punching position. Data in the card at the reading station may be duplicated into the card at the punching station. As each reading brush senses a hole on the card at the reading station, an impulse is sent to the corresponding punch die and a punch is made in the card at the punching station.

Card Stacker

The card stacker is found above the reading station on the upper-left side of the machine. The stacker holds about 500 cards and is the container for cards after they have been processed by the machine. Cards remain in sequence when removed from the stacker.

Main-line Switch

The main-line switch is located at the top of the stacker and must be turned on to activate the keypunch. It takes the keypunch about $\frac{1}{2}$ a minute to warm up prior to punching. When the stacker is full, this switch is automatically turned off.

Program Unit

The program unit (Fig. 3–2) is located between the hopper and the stacker at the middle of the keypunch and consists of a program *drum,* a program card, and a set of starwheels. The program drum holds the program card, which contains punching that is sensed by the starwheels. The card, created by the keypunch operator and "read" by the starwheels, causes the keypunch to automatically skip, duplicate, or shift from alphabetic to numeric punching with a minimum of effort by the keypunch operator.

Column Indicator

The column indicator (Fig. 3–2) is located at the base of the program drum. Its purpose is to locate exactly the column that is being punched or read and to point to the number of the card column to be punched.

Pressure Roll Release Lever

The pressure roll release lever (Fig. 3–2) is located below the column indicator. Its purpose is to allow jammed cards at either the punching or reading station to be removed.

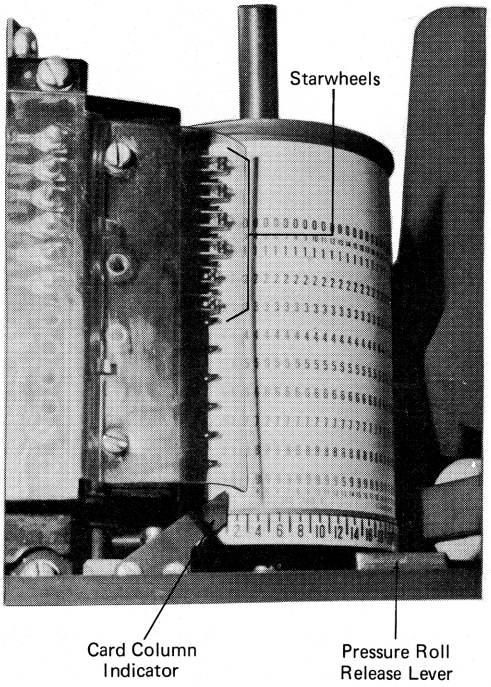

Starwheels
Card Column Indicator
Pressure Roll Release Lever

Fig. 3–2 Program unit, column indicator, and pressure roll release lever.

Backspace Key

The backspace key (Fig. 3–3) is located below the reading and punching stations on the front of the machine. As long as it is pushed inward, cards at the punching and reading stations, the card on the program drum, and the column indicator are automatically backspaced until column 1 is reached.

Program Control Lever

The program control lever (Fig. 3–3) is a small V-shaped lever found on the front of the keypunch directly below the program unit enclosure. Its purpose is to activate the program unit. When this lever is depressed to the right, the starwheels are raised and program control is off. When the program control lever is depressed to the left, the starwheels are lowered onto the program card and program control is on.

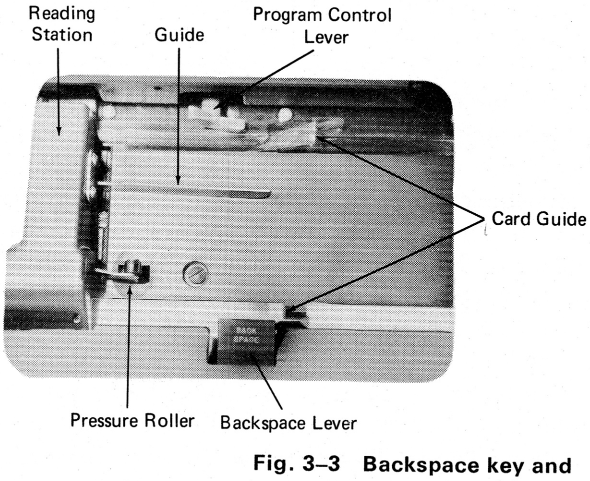
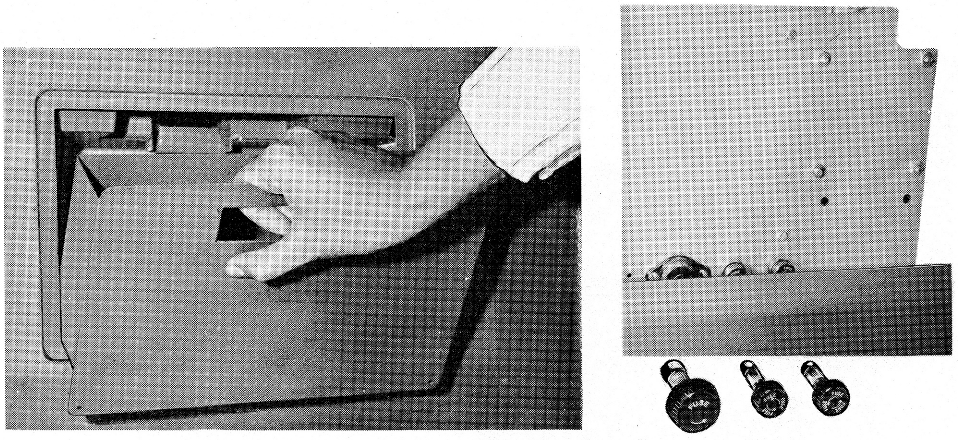

Reading Station
Guide
Program Control Lever
Card Guide
Pressure Roller
Backspace Lever

Fig. 3–3 Backspace key and program control lever.



A

B

Fig. 3–4 A, Chip box; B, fuses.

Chip Box and Fuses

The chip box and the fuses (Fig. 3–4) are located on the lower front portion of the keypunch. The chip box is a container for the material that has been punched from the cards. The chip box should be emptied daily. Removal of the chip box allows access to the machine fuses.

Reading Board

The reading board (Fig. 3–5) is the shelf or desk on which the source documents are placed. Note that the keyboard is positioned on the right side of the reading board so that the source document may be placed to its left.

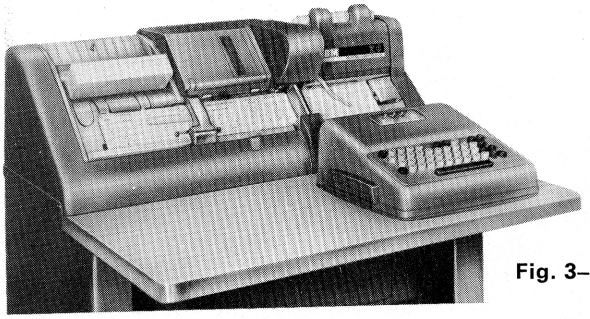


Fig. 3–5 Reading board.

Keyboard

There are two types of keyboards available for use with the 26 keypunch. The more common is the combination keyboard. It contains keys for punching numeric, alphabetic, and a variety of special characters. The other keyboard, a numeric keyboard, contains keys for punching numeric characters plus two special characters. See Fig. 3–6 for an illustration of the two keyboards.

Located at the top of the combination keyboard are three toggle switches that control automatic feeding, duplicating, skipping, and printing on a card. The first switch on the left is the automatic feed (AUTO FEED) switch. When this switch is turned on, feeding from the hopper is automatic as long as there are cards in it. The stacking of cards, as each card is released from the reading station, is also automatic. The middle switch is the AUTO SKIP DUP switch. When the switch is turned on, automatic skipping of card columns not to be punched by the operator

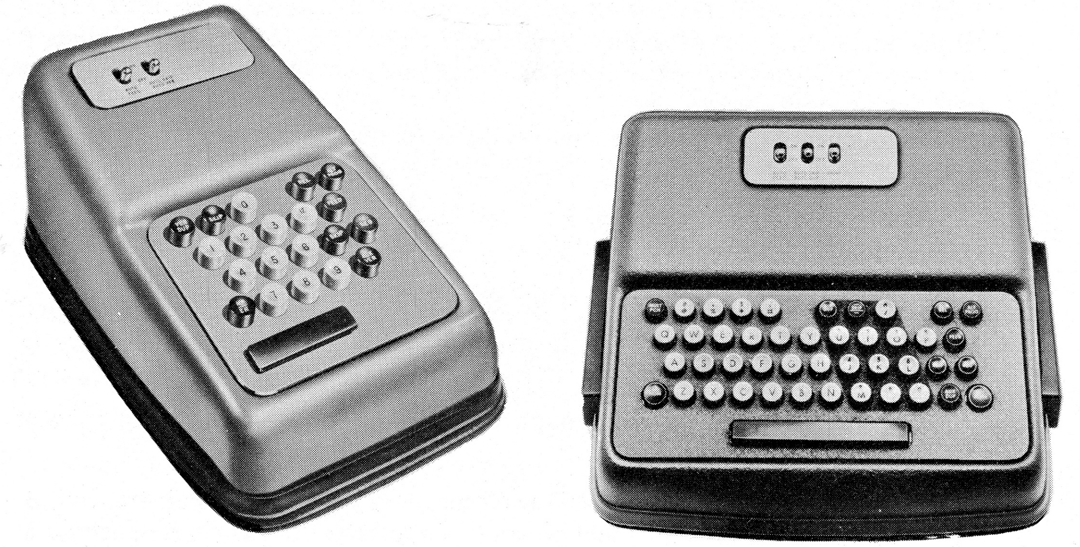

A
B

Fig. 3–6 A, Numberic keyboard; B, combination keyboard.

and automatic duplication of entire fields are possible. The automatic skipping and duplicating (auto skip dup) switch is controlled by the program unit. The third switch, PRINT, allows printing to occur as each card column is punched; it is included on the 26 keypunch but not on the 24.

Combination Keyboard

Upon close observation it can be seen that the combination keyboard of the keypunch machine (Fig. 3–7) is quite similar to the keyboard of the typewriter. The major difference between the two is the arrangement of the numeric characters. On the typewriter the numeric keys are found at the top of the keyboard. Because most keypunching is composed of numeric information, the numeric keys on the keypunch are closely grouped for a one-handed, three-finger touch system of operation. This close grouping of the numbers eliminates the back-and-forth motion of the hand that would be required if the numeric keys were arranged as on the typewriter; it also permits the left hand to position the source document while punching.

The keys that cause punching to occur are gray with blue lettering and the functional controlling keys are dark blue with white lettering. The home keys are slightly more concave than the rest for ease of operation. It is not necessary to wait

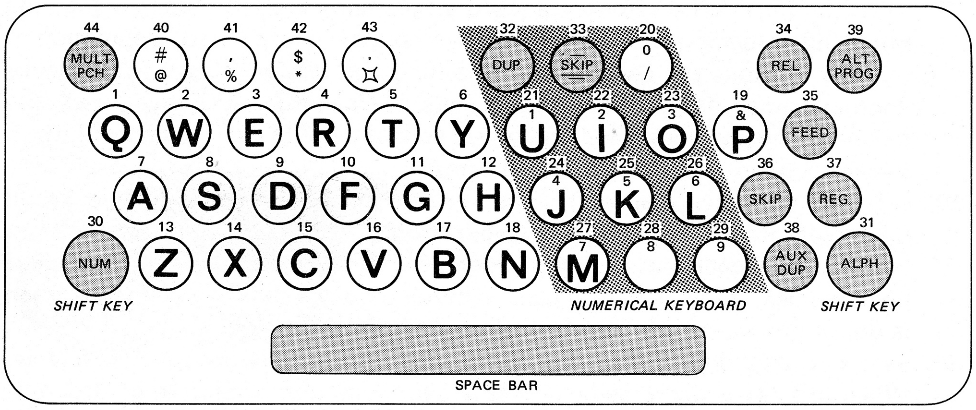

44 MULT PCH
40 # @
41 , %
42 $ *
43 . ⌑
32 DUP
33 SKIP
20 0 /
34 REL
39 ALT PROG
1 Q
2 W
3 E
4 R
5 T
6 Y
21 1 U
22 2 I
23 3 O
19 & P
35 FEED
7 A
8 S
9 D
10 F
11 G
12 H
24 4 J
25 5 K
26 6 L
36 SKIP
37 REG
30 NUM
13 Z
14 X
15 C
16 V
17 B
18 N
27 7 M
28 8
29 9
38 AUX DUP
31 ALPH
SHIFT KEY
NUMERICAL KEYBOARD
SHIFT KEY
SPACE BAR

Fig. 3–7 Combination keyboard chart.

for one key to rise before pressing another; however, no two keys can be depressed at the same time. The keys that punch both alphabetic letters and the digits 0 through 9 are distinguished by a dark blue background. These keys are referred to as the combination keys.

The touch system for the numeric keys is as follows:

Index finger	digits 1, 4, 7
Middle finger	digits 2, 5, 8
Ring finger	digits 0, 3, 6, 9

Each key on the chart has been numbered for purposes of description.

Functional Keys

The keys that are numbered 30 through 39 and 44 control the various functions of the keypunch.

30. NUM (numeric shift) The NUM key places the keyboard into a numeric shift or mode for as long as it is held down. It is depressed to allow the punching of numbers in an alphabetic field.

31. ALPH (alphabetic shift) The ALPH key places the keyboard into an alphabetic shift or mode for as long as it is held down. It is depressed to allow the punching of alphabetic letters in a numeric field.

32. DUP (duplicate) The DUP key allows data from the card at the reading station to be duplicated into the card at the punching station.

33. SKIP (dash skip) If the dash skip key is depressed while the keypunch is in numeric shift, an 11-zone punch will be placed in the card and skipping will occur if program control is on. If the dash skip key is depressed while the keypunch is in alphabetic shift, an 11-zone punch will also be punched but no skipping will occur.

34. REL (release) Depression of the REL key causes the cards at the punching and reading stations to be transmitted to the next station.

35. FEED (card feed) When depressed, the FEED key will cause a card to be fed from the hopper of the keypunch. If there is already a card at the punching station, it will cause that card to be registered. If there is a card at the reading station, it will cause it to be registered. If there is a card to the left of the reading station, it will cause it to be stacked.

36. SKIP When depressed, the SKIP key will cause a single card column to be spaced over if program control is off. If program control is on, this key allows skipping of the particular field for which it is depressed. It is generally used for skipping over unused columns in an alphabetic field. *Note:* This key must not be confused with the dash skip key. No 11-zone punch is placed in the card when the skip key is depressed.

37. REG (register) The REG key is used when cards are fed manually into the punching or reading stations and the card hopper is not utilized. Depression of this key registers the cards at the punching and reading stations and stacks another card at the left of the reading station. When the card is *registered,* it is mechanically positioned and firmly held so that punching or reading will begin in card column 1 at all times for all cards.

38. AUX DUP (auxiliary duplicate) The AUX DUP key is an optional feature. When depressed, this key causes duplication from a master card, mounted on an auxiliary duplicating drum. With program control, one depression duplicates an entire field from the master card. Without program control, only one column is duplicated from the master card for each key depression.

39. ALT PROG (alternate program) The ALT PROG key is an optional feature. When this key is depressed, an alternate program unit is put into control over the normal program unit. This key is depressed either at the beginning of or during the card cycle for each card that requires alternate program control instead of normal program control. The alternate program is effective for the remainder of the card and ends when the card has been completed.

44. MULT PCH (multiple punch) When the MULT PCH key is held down, normal spacing is prevented. This allows more than one digit to be punched in a single card column. The keyboard is automatically placed in numeric shift when this key is depressed.

Punching Keys

The keys numbered 1 through 18 will punch the alphabetic character indicated. Unless the keyboard is in alphabetic shift, however, the keyboard will lock and operation can be resumed only by:

1. Releasing the card.
2. Depressing the alphabetic shift key. This will also cause the alphabetic character to be punched.
3. Depressing the backspace key.

Combination keys 19 through 29 can be depressed when the keyboard is in either alphabetic or numeric shift. When the keyboard is in alphabetic shift, the characters printed at the bottom of the keys may be punched. When in numeric shift, the characters printed at the top of the keys may be punched. The keys numbered 28 and 29 that punch the digits 8 and 9 may be depressed when the keyboard is in either alphabetic or numeric shift.

Keys 40 through 43 are additional special character keys. When the keyboard is in alphabetic shift, the characters at the bottom of the keys may be punched. When in numeric shift, the characters at the top of the keys may be punched.

Space Bar

The space bar can be depressed at any time during a manual punching operation. If the keypunch is not equipped with a multiple punch key, this bar can be held down to permit multiple punching.

OPERATING FEATURES OF THE 29 KEYPUNCH

As noted at the beginning of this chapter, the three most common keypunch machines currently in use are the 24, 26, and 29 keypunches. The 29 keypunch (Fig. 3–8) is the most recent of the three machines. It has only been available for the

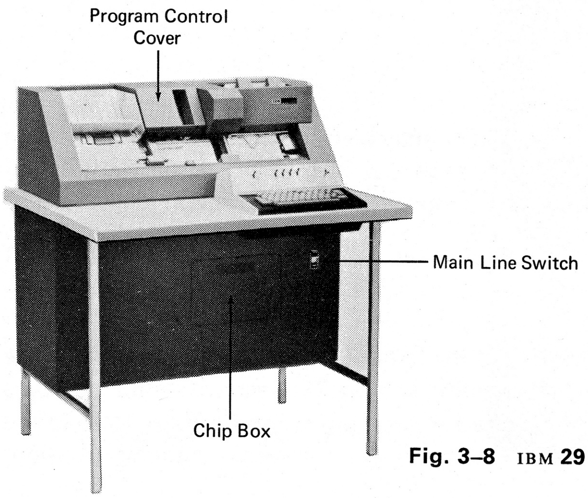


Fig. 3–8 IBM **29 keypunch.**

past few years and is generally found in computer installations that utilize the IBM 360 Computer configuration.

The model A is the basic card punch. It can be obtained with either a number (12-character) keyboard or a combination (48- or 64-character) keyboard. It may have a print unit as an optional feature.

The Model B, or the IBM Left-Zero Insertion Card Punch, can also be obtained with either the numeric or combination keyboard but may also come with the printing mechanism. The Model B performs the same functions as the Model A and in addition features left-zero insertion. With left-zero insertion it is unnecessary to key in the preceding zeros in a numeric field. Preceding zeros may be inserted automatically in fields that are three to eight digits in length.

The Model C, or the IBM Interpreting Card Punch, is available only with the combination keyboard, performs the same functions as the Model A, and in addition interprets prepunched cards. The combination keyboard may be either a 48- or a 64-character arrangement. The Model C reads cards that have been previously punched column by column and prints the information punched in each column directly over the same column. There can be no punching during the interpreting operation.

Hopper

The hopper (Fig. 3–9) is located at the upper-right-hand corner of the keypunch. It holds approximately 500 cards, which are placed into the hopper face forward, 9 edge down. The hopper is used when card volume is large and automatic card feeding is desired. Cards move from the hopper to the punching station.

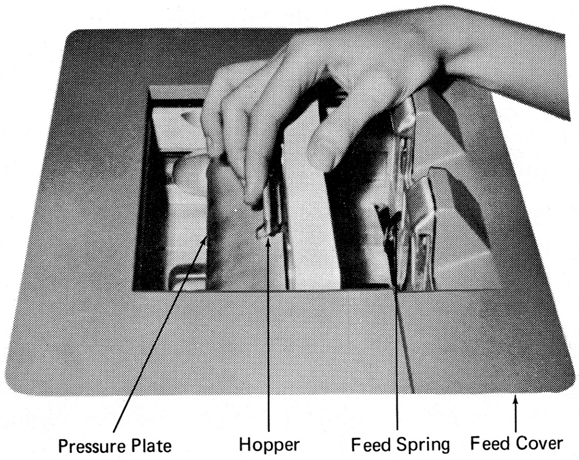


Fig. 3–9 Hopper.

Punching Station

The punching station (Fig. 3–10) is located directly below the hopper. The punching station contains 12 punching dies, one for each row on the card. As each punching key on the keyboard is depressed, the proper punch dies become active and punching occurs on the card.

Reading Station

The reading station (Fig. 3–10) is found to the left of the punching station. After the card has been punched, it moves to the reading station. The reading station contains a contact roll and 12 reading brushes, one for each punching position. Data in the card at the reading station may be duplicated into the card at the punching station.

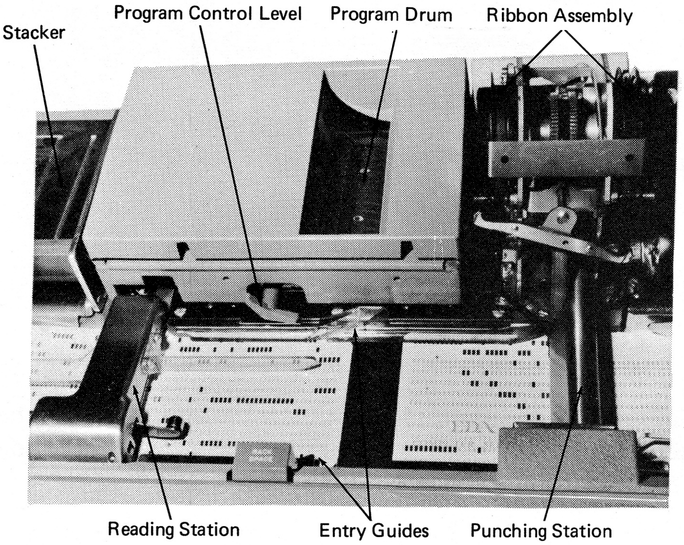

Stacker
Program Control Level
Program Drum
Ribbon Assembly
Reading Station
Entry Guides
Punching Station

Fig. 3–10 Punching station and reading station.

As each reading brush senses a hole on the card at the reading station, an impulse is sent to the corresponding punch die and a punch is made in the card at the punching station.

Card Stacker

The card stacker (Fig. 3–11) is found above the reading station on the upper-left side of the machine. The stacker holds about 500 cards and is the container for cards after they have been processed by the machine. Cards remain in sequence when removed from the stacker. An estimate can be made of the number of cards punched by a convenient scale located on the stacker. When the stacker is full, power is turned off until the stacker is emptied.

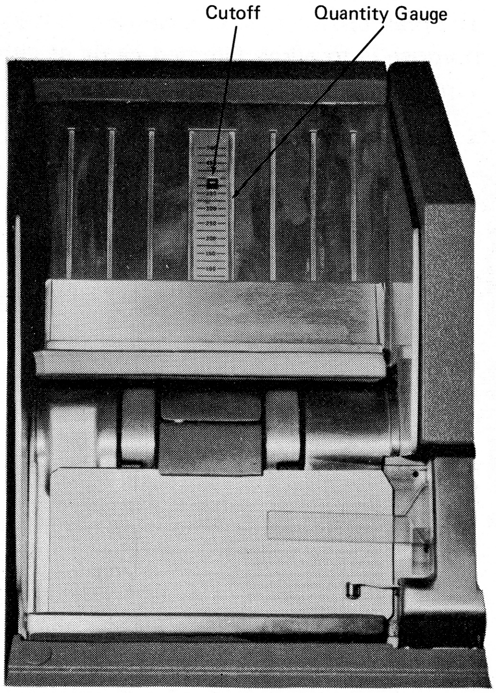

Cutoff
Quantity Gauge

Fig. 3–11 Card stacker, cutoff, and quantity gauge.

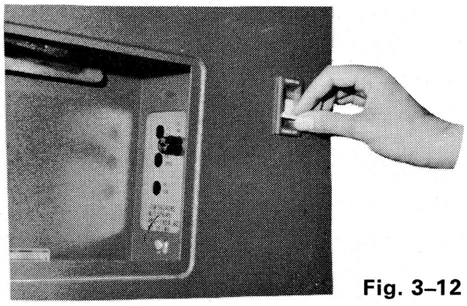


Fig. 3–12 Main-line switch.

Main-line Switch

The main-line switch (Fig. 3–12) is located on the front of the keypunch below the keyboard and must be turned on to activate the keypunch. The keypunch is ready for immediate use after the main-line switch has been turned on.

Program Unit

The program unit (Fig. 3–13) is located between the hopper and the stacker at the middle of the keypunch. The program unit consists of a program *drum,* a program card, and a set of starwheels. The program drum holds the program card, which contains punching that is sensed by the starwheels. The card, created by the keypunch operator and "read" by the starwheels, causes the keypunch to automatically skip, duplicate, or shift from alphabetic to numeric punching with a minimum of effort by the keypunch operator.

Column Indicator

The column indicator (Fig. 3–13) is located at the base of the program drum. The purpose of the column indicator is to locate exactly the column that is being punched or read and to point to the number of the card column to be punched.

Pressure Roll Release Lever

The pressure roll release lever (Fig. 3–13) is located below the column indicator. Its purpose is to allow jammed cards at either the punching or reading station to be removed.

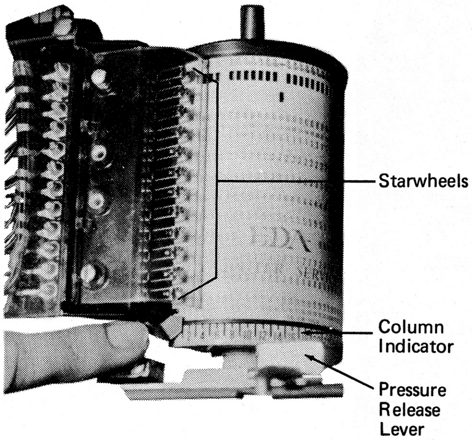


Fig. 3–13 Program unit, column indicator, and pressure roll release lever.

Backspace Key

The backspace key (Fig. 3–14) is located below the reading and punching stations on the front of the machine. As long as it is pushed inward, cards at the punching

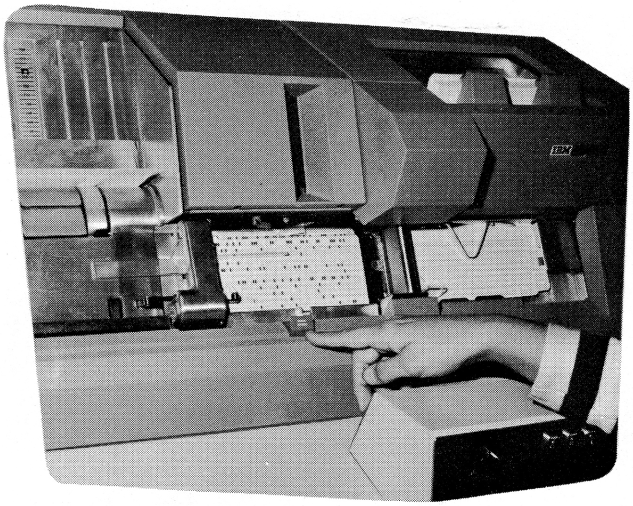


Fig. 3–14 Backspace key and program control lever.

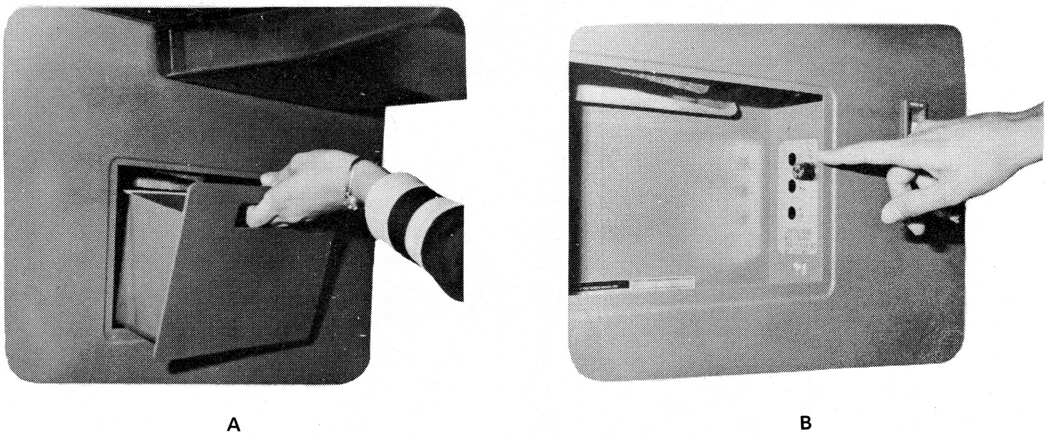
and reading stations, the card on the program drum, and the column indicator are automatically backspaced until column 1 is reached.

Program Control Lever

The program control lever (Fig. 3–14) is a small V-shaped lever found on the front of the keypunch directly below the program unit enclosure. Its purpose is to activate the program unit. When this lever is depressed to the right, the starwheels are raised from the card on the program drum and program control is off. When the program control lever is depressed to the left, the starwheels are lowered onto the program card and program control is on.

Chip Box and Fuses

The chip box and the fuses (Fig. 3–15) are located on the lower front portion of the keypunch. The chip box is a container for the material that has been punched from the cards. The chip box should be emptied daily. Removal of the chip box allows access to the machine fuses.



A

B

Fig. 3–15 A, Chip box; B, fuses.

Reading Board

The reading board (Fig. 3–16) is the shelf or desk on which the source documents are placed. Note that the keyboard is positioned on the right side of the reading

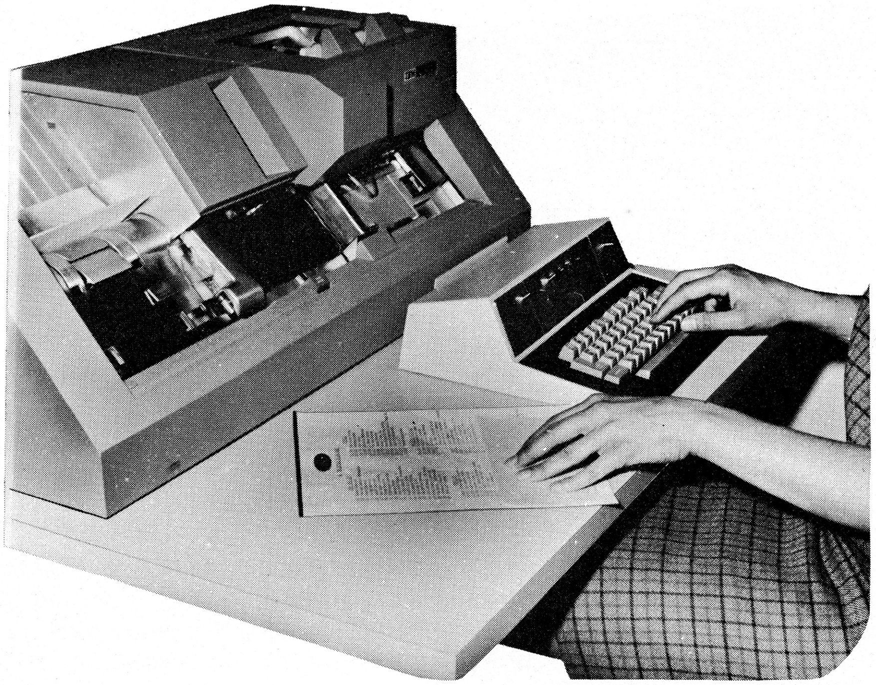


Fig. 3–16 Reading board.

board so that the source document may be placed to its left. The keyboard may be rotated on the desk for the convenience of the keypunch operator.

Keyboard

There are two basic types of keyboards available for use with the 29 keypunch. The more common is the combination keyboard. It contains keys for punching numeric, alphabetic, and a variety of special characters. The other keyboard, a numeric keyboard, contains keys for punching numeric characters 0 through 9 plus two special characters. See Fig. 3–17 for an illustration of the combination keyboard.

Located at the top of the keyboard are three toggle switches that control automatic feeding, duplicating, skipping, and printing on a card. The first switch on the left is the AUTO SKIP DUP switch. When the switch is turned on, automatic skipping of card columns not to be punched by the operator and automatic duplication of entire fields are possible. The automatic skipping and duplicating (auto skip dup) switch is controlled by the program unit. The switch to the right of the auto skip dup

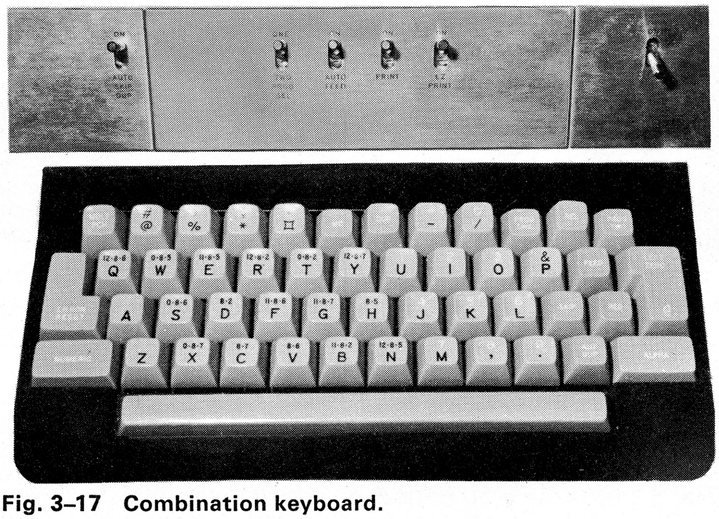


Fig. 3–17 Combination keyboard.

switch is the ONE TWO PROG SEL switch. This switch enables the 29 keypunch to make use of the two program levels; each program card can contain two totally different, complete 80-column programs. Either program can be selected for card-to-card use by setting the program selection switch to either the ONE or the TWO position. Programs can also be alternated by means of the program selection keys on the keyboard. The switch to the right of the program selection switch is the AUTO FEED switch. When the automatic feed switch is turned on, feeding from the hopper is automatic as long as there are cards in it. The stacking of cards is also automatic as each card is released from the reading station. The fourth switch, PRINT, allows printing to occur as each card column is punched, provided that the machine is equipped with a printing mechanism. The next switch, the LZ PRINT switch, is found on all printing models. When this switch is turned on, the left-zero print feature is activated and automatic punching of zeros to the left of the first significant digit in numeric fields occurs through program control. On Model C keypunches the next switch is labeled PUNCH/INTERPRET (not shown in Fig. 3–17). When the switch is set on PUNCH, the Model C functions just as a Model A keypunch. When set on INTERPRET, prepunched cards that have not been printed on can be fed through the keypunch, and interpreting of the data punched on the card takes place by means of program control. The last switch on the right is the CLEAR switch. When this switch is on, all cards between the feed hopper and the stacker are transported to the stacker with no further punching.

Combination Keyboard

Upon close observation it can be seen that the combination keyboard of the keypunch machine is similar to the keyboard of a typewriter in that the alphabetic characters are located in the same position. The major difference between the two lies in the arrangement of the numeric characters and the special characters. On the typewriter the numeric keys are found at the top of the keyboard. Because most keypunching is composed of numeric information, the numeric keys on the keypunch are closely grouped for a one-handed, three-finger touch system of operation. This close grouping of the numbers eliminates the back-and-forth motion of the hand that would be required if the numeric keys were arranged as on the typewriter; it also permits the left hand to position the source document while punching.

The 29 keypunch may be obtained with either a 48- or a 64-character combination keyboard. A choice between two sets of characters is offered on the 48-character keyboard. The "A" set, in addition to the 26 letters of the alphabet and the digits 0 through 9, punches special business-type symbols. The "H" arrangement punches the alphabet, digits 0 through 9, and special mathematic or FORTRAN-type characters. Note that the actual punching of the special characters of A and H arrangements are the same. Only the interpretation of the characters is different; for example, a 12 punch in arrangement A is an ampersand, and a 12 punch in arrangement H is a + (plus) symbol. It should be noted that all 48-character keyboards show the actual punched hole codes of the special characters instead of the symbol.

The 64-character keyboard is referred to as arrangement EL (Fig. 3–18). The 64-character keyboard punches the letters of the alphabet, the digits 0 through 9, and a variety of special characters that are utilized in the operation of the IBM 360 Computer. It is interesting to note that the EL arrangement contains all the characters in arrangement A except for the lozenge ⌑. It also contains all the characters in the H arrangement, but the actual punching has been changed. For example, a left parenthesis in the H arrangement consists of a 0–4–8 punch in the same column. The EL arrangement for a left parenthesis is a 12–5–8 punch in the same column. The keys on the 29 keypunch are either punching or functional keys that, when depressed, cause the keypunch to perform a specific operation. Each key on the keyboard chart has been numbered for purpose of description.

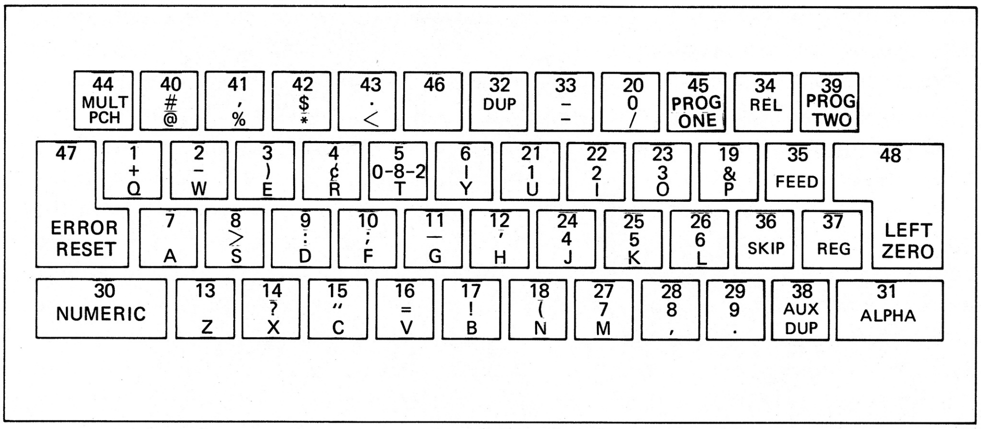


Fig. 3–18 EL keyboard character chart.

Functional Keys

The keys that are numbered 30 through 32, 34 through 39, and 44 through 48 are keys that control the various functions of the keypunch.

30. NUMERIC (numeric shift) The NUMERIC key places the keyboard into a numeric shift or mode for as long as it is held down. It is depressed to allow the punching of numbers in an alphabetic field.

31. ALPHA (alphabetic shift) The ALPHA key places the keyboard into an alphabetic shift or mode for as long as it is held down. It is depressed to allow the punching of alphabetic letters in a numeric field.

32. DUP (duplicate) The DUP key allows data from the card at the reading station to be duplicated into the card at the punching station. With program control, duplication occurs at a speed of 18 to 20 columns per second. Without program control, duplication occurs at a speed of 9 to 10 columns per second.

34. REL (release) Depresson of the REL key causes the cards at the punching and reading stations to be transmitted to the next station.

35. FEED (card feed) When depressed, the FEED key causes two cards to be fed from the hopper of the keypunch. If there is already a card registered at the punching station, it is inoperative.

36. SKIP When depressed, the SKIP key will cause a single card column to be spaced over if program control is off. If program control is on, skipping is allowed for the particular field for which it is depressed at a speed of 80 columns per second. It is generally used for skipping unused columns in an alphabetic field.

37. REG (register) The REG key is used when cards are fed manually into the punching or reading stations and the card hopper is not utilized. Depression of this key registers the cards at the punching and reading stations. When the card is *registered,* it is mechanically positioned and firmly held so that punching or reading will begin in card column 1 at all times for all cards.

38. AUX DUP (auxiliary duplicate) The AUX DUP key is an optional feature. When depressed, it causes duplication from a master card mounted on an auxiliary duplicating drum. With program control, one depression duplicates an entire field from the master card. Without program control, only one column is duplicated from the master card for each key depression.

39. PROG TWO (program two) When the PROG TWO key is depressed, program control is under the direction of that section of the program card containing program two punching. If program two is not used on the program card and the PROG TWO key is depressed, program control is eliminated, making it unnecessary to raise the starwheels. Depression of the PROG TWO key overrides the setting of the program selection switch.

44. MULT PCH (multiple punch) When the MULT PCH key is held down, normal spacing is prevented. This allows more than one digit to be punched in a single card column. The keyboard is automatically placed in numeric shift when this key is depressed. This key makes it possible to punch any special character devised even without the full 64-character keyboard. However, duplication or printing of these special characters should not be attempted on printing models of the 29 keypunch. A solid square warning mark is printed when an attempt is made to print either by punching or duplicating one of the characters not found on the keyboard.

45. PROG ONE (program one) When this key is depressed, program control is transferred from program two to program one. Depression of the PROG ONE key overrides the setting of the program selection switch.
46. MC (master card) The MC key is an optional feature. It is used to insert master cards from which information is to be duplicated in front of a group of cards to be punched. It is also used to insert blank or trailer cards at the end of a group of punched cards.
47. ERROR RESET A locked keyboard may be unlocked by depressing this key. This allows for faster operation than would unlocking the keyboard by means of the backspace key. On Model B keypunches the error reset key allows the correcting of operator-detected keying errors in a field programmed for left-zero insertion before that field is punched.
48. LEFT ZERO (Model B keypunches) Depressing the LEFT ZERO key starts the punching of a left-zero field. This key is inoperative on Model A and Model C keypunches.

Punching Keys

On the 64-character keyboard all keys are dual-character or combination keys except for the A key (key 7) and the Z key (key 13). If the keyboard is in numeric shift and the A or Z key is depressed, the keyboard will lock and no punching is possible until the error reset key is depressed. Dual-character keys can be depressed when the keyboard is in either alphabetic or numeric shift. When the keyboard is in alphabetic shift, the characters printed at the bottom of the keys are punched, and when in numeric shift, the characters printed at the top of the keys are punched.

Keys 33 and 40 through 43 are additional special character keys. When the keyboard is in alphabetic shift, the characters at the bottom of the keys are punched, and when in numeric shift, the characters at the top of the keys are punched.

It is not necessary to wait for one of the punching keys to rise before pressing another; however, no two keys can be pressed at the same time. The touch system for the numeric keys is as follows:

Index finger	digits 1, 4, 7
Middle finger	digits 2, 5, 8
Ring finger	digits 0, 3, 6, 9

Space Bar

The space bar can be depressed at any time during a manual punching operation.

LABORATORY ASSIGNMENTS

1. Examine an actual 24, 26, or 29 keypunch and find each of the external features described in the text. Be sure you can find the following:

   Main-line switch
   Hopper
   Stacker
   Program control lever
   Backspace key
   Program drum
   Pressure roll release lever
   Column indicator
   Functional switches
   Punching station

Chip box
Fuses
Reading board
Reading station
Printing unit if a 26 or 29

2. While looking in the window of the program unit, raise the starwheels by depressing the right side of the program control lever. Lower the starwheels. Be able to identify when program control is on or off.
3. Turn on the main-line switch and immediately depress the REL key on the keyboard. Keep your eyes on the column indicator. What happened? If nothing occurs, wait for about 30 seconds. How can you tell when the keypunch has warmed up?
4. Turn off the main-line switch.

REVIEW QUESTIONS

Answer the following questions for either the 26 or 29 keypunch.

1. What is usually the first step in any data processing application?
2. What are the numbers of the three most common keypunching machines?
3. How are cards placed in the hopper? How many cards does the hopper hold?
4. What is the name of the container for cards after they have been punched by the keypunch machine?
5. What is the main-line switch?
6. What parts make up the program unit?
7. What is the purpose of the column indicator?
8. What is the purpose of the pressure roll release lever?
9. How is continuous backspacing accomplished?
10. When is program control on? Off?
11. Where are the fuses located?
12. How often should the chip box be emptied?
13. What are the two types of keyboards?
14. Name the functional switches on the keypunch and give the purpose of each.
15. What is a combination key?
16. What digits are punched with the index finger? The middle finger? The ring finger?
17. Which key will punch an 11-zone punch when depressed?
18. Which key allows more than a single punch to be placed in a card column?

QUESTION CARDS

Figures 3–19 through 3–22 contain questions that are to be interpreted. Write the question and the answer to the question on a separate sheet of paper.

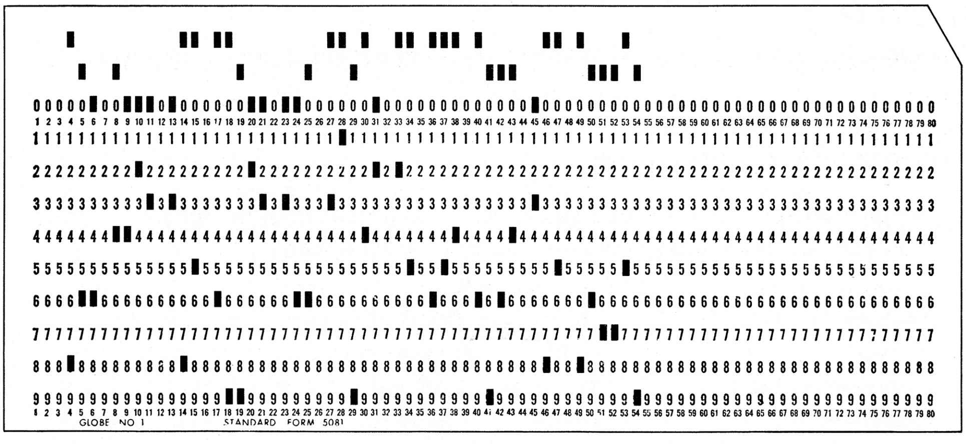


Fig. 3–19

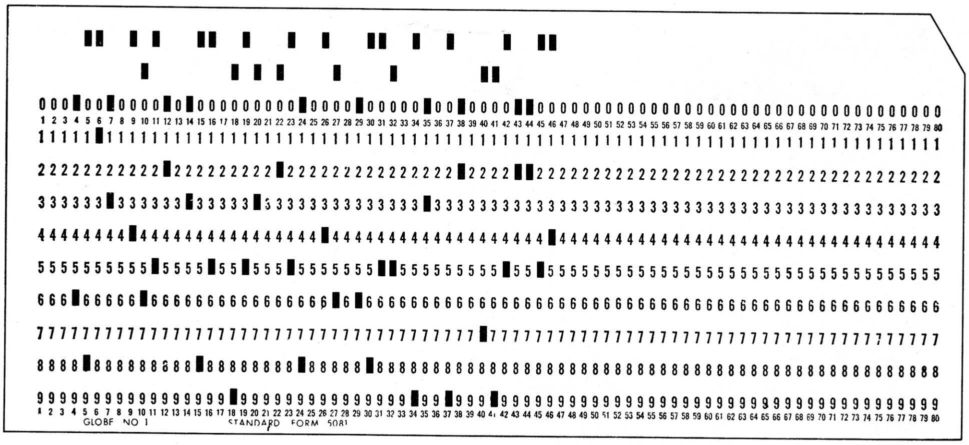

GLOBE NO 1
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Fig. 3–20

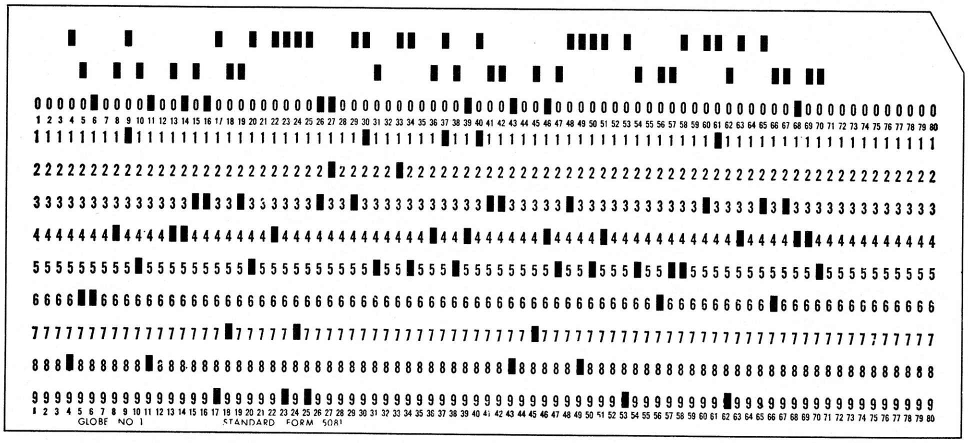
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Fig. 3–21

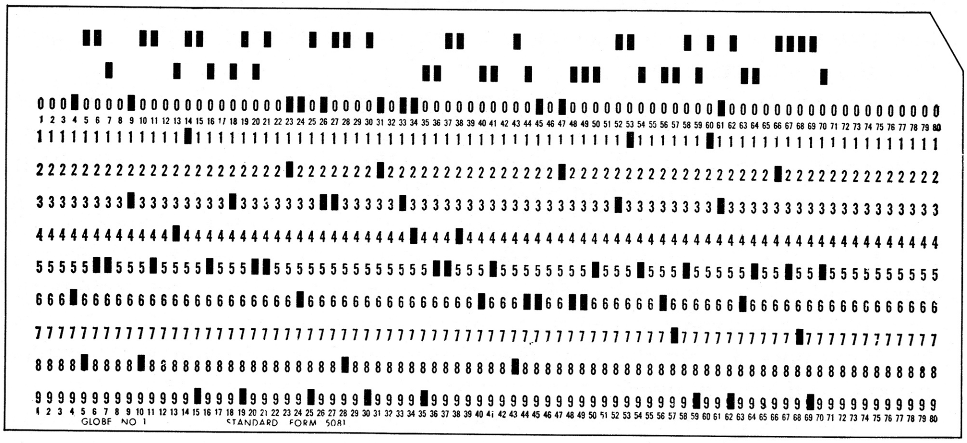
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Fig. 3–22

chapter 4 BASIC OPERATION OF THE KEYPUNCH

KEYPUNCHING WITHOUT PROGRAM CONTROL

There are three operations that may be accomplished on the keypunch that do not require program control:

1. *The punching of a single field or control punch in a card.* This card is usually required by a machine operator to be used in other machine operations. To punch a single card, it is inserted directly into the card bed to the right of the punching station, the register key is depressed, and punching or spacing may begin. Because program control is not used, the keyboard is in alphabetic shift, and therefore the numeric shift key must be held down while punching numbers from the combination keys.
2. *Duplicating damaged cards.* To duplicate a card that has been nicked or slightly damaged, the card is placed in the card bed to the right of the reading station and a blank card is placed to the right of the punching station. Depression of the register key registers both cards. The duplicate key is then depressed and held down for as long as duplication is required. When cards have been duplicated, it is always good practice to *sight check* them. This is done by placing the duplicated or corrected card in front of the incorrect or original card. Hold both up to the light and see that daylight appears in all punched columns. See Fig. 4–1 for an example of sight checking. Good practice warrants destroying the duplicated card if it is not needed.

   Data processing machines are generally high-speed machines and consequently require that all cards be in good condition. A bad card that is slightly nicked, warped, or damaged in some way can cause a card jam and unnecessary delay. A damaged card should always be replaced with a good duplicate. If the card is damaged so that it cannot possibly be read by the keypunch or by the operator, the original source document must be examined. Generally, however, many damaged cards are only nicked or contain a staple or pin. After smoothing the damaged card, it can generally be duplicated on the keypunch without difficulty.
3. *Correcting cards that have been mispunched.* If it is necessary to correct a card that has been mispunched, the error card is placed in the card bed to the right of the reading station and a blank card is placed to the right of the punching station. Depression of the register key registers both cards. The duplicate key is

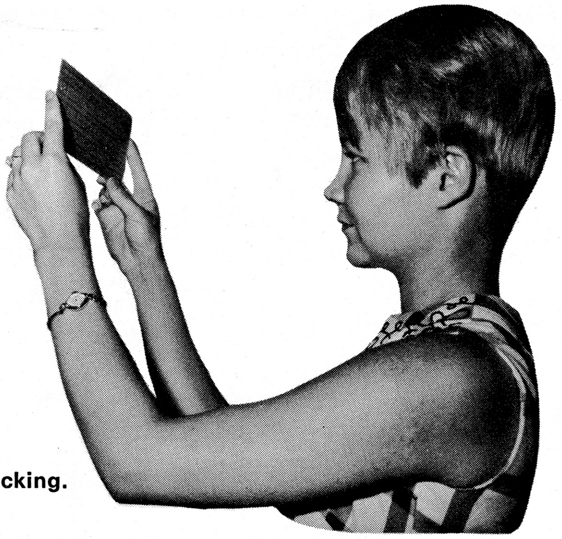


Fig. 4–1 Sight checking.

then depressed and held down until the card column containing the error is reached. The correct data are keyed by the operator and the rest of the card is duplicated by means of the duplicate key. Many times the error card is found on some table top and is picked up and returned to the original deck; to prevent this, the error card should be destroyed after correction.

These three operations do not need program control because they are generally a single card operation.

PUNCHING PROCEDURES

Procedure for Punching a Single Field on a Card

By means of the following procedure, use a 26 or 29 keypunch and produce the necessary data card.

Objective: Punch a card containing the date in card columns 1 through 6 and an X control punch in card column 10 (Fig. 4–2). (The date will be recorded in numeric form. *Example:* January 1, 1969, would be recorded as 010169. Note that the year has been abbreviated to the last two digits. Note also that because the months October, November, and December are the tenth, eleventh, and twelfth months, they require two card columns, whereas all other months must be preceded by a high-order zero; the first nine days of the month must also be preceded by

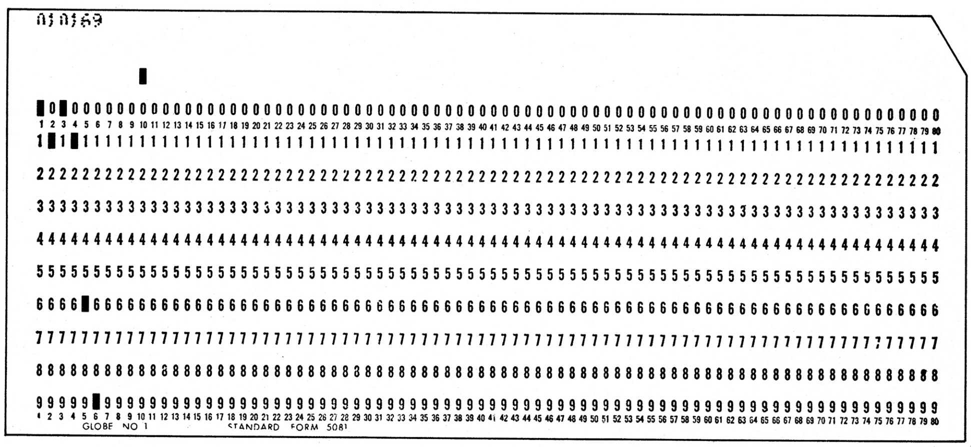


Fig. 4–2 Numeric coding example of a data card.

leading zeros to compensate for the extra card column required for the remaining days of the month.)

1. Turn on the main-line switch and then depress the REL key. When the keypunch is warmed up sufficiently for operation, the column indicator will make one complete revolution and lock into position at card column 1.
2. During the warm-up period, the functional switches should be off and the program unit should be turned off by depressing the program control lever. The program control mechanism can be seen to rise from the card on the program drum. When the starwheels are not resting on the card, the program unit is off. See Fig. 4–3.

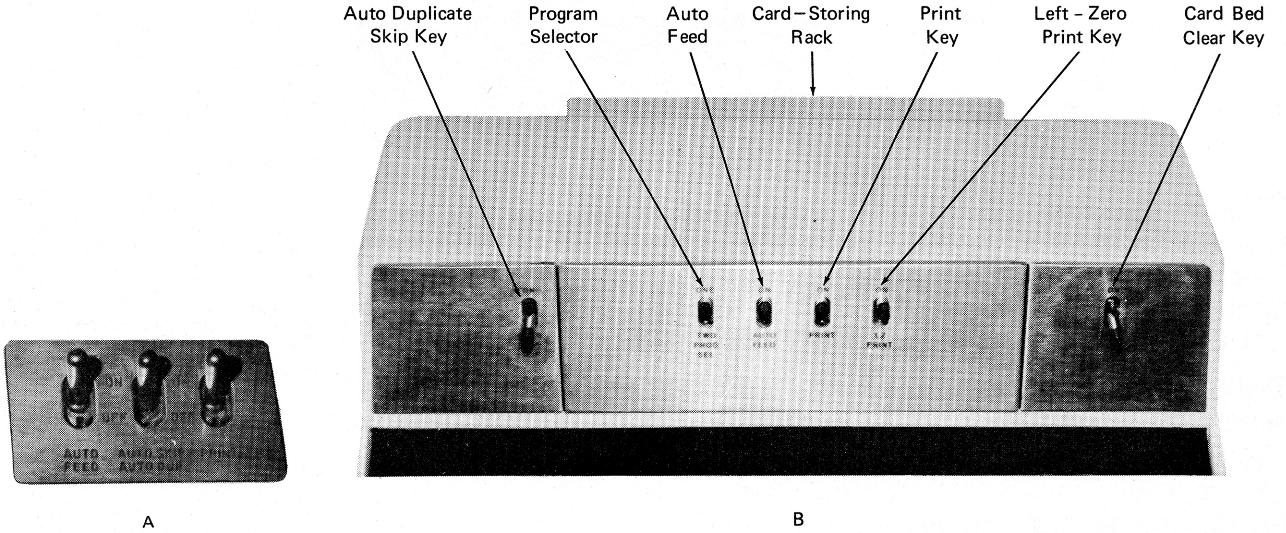

Auto Duplicate Skip Key
Program Selector
Auto Feed
Card – Storing Rack
Print Key
Left - Zero Print Key
Card Bed Clear Key
ON
OFF
AUTO FEED
AUTO DUP
PRINT
ONE
TWO PROG SEL
ON
AUTO FEED
ON
PRINT
ON
12 PRINT
A
B

Fig. 4–3 Setting the switches and program lever. A, 26 keypunch; B, 29 keypunch.

3. Place the card to be punched into the card bed to the right of the punching station. This is done by inserting the card beneath the metal strip at the top of the card bed and into the metal guides located at the bottom of the card bed. See Fig. 4–4. Care should be taken not to lift up on the card feed pressure finger at any time. Slide the card as far as possible toward the punching station until the card stops. Then pull the card about $\frac{1}{4}$ inch to the right. Keep the card flat on the card bed so that it will be registered properly. It is very important that the card not actually touch the punching dies when the card is registered, for it might be registered improperly and punching will not begin in card column 1 but in card column 2 or 3.

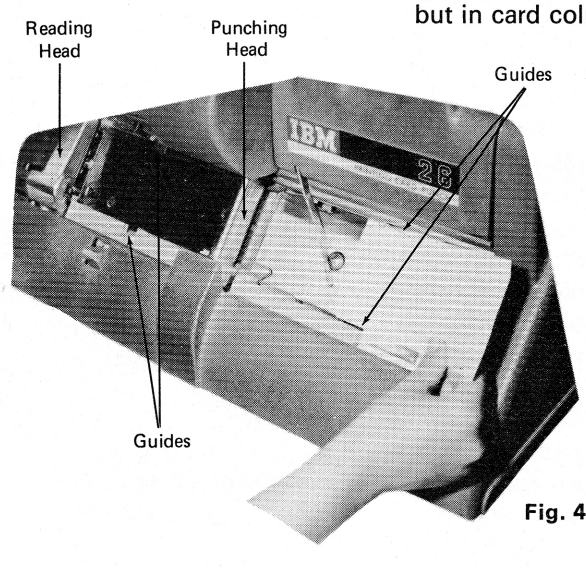

Reading Head
Punching Head
Guides
IBM
26
Guides

Fig. 4–4 Positioning a card for punching.

4. Depress the REG key. Note the position of the column indicator.
5. While holding down the numeric shift key, depress the proper combination keys to punch the proper date into card columns 1 through 6. **Note the position of the column indicator as each numeric character is punched.** Remember that the column indicator shows the card column to be punched.
6. Press the space bar until the column indicator is on 10. (The even-numbered columns on the column indicator are designated by short lines and are labeled. The odd-numbered columns are not numbered but are designated by the long lines. Refer to Fig. 3–8.)
7. On the 26 keypunch, press the dash SKIP key to punch the X control punch. On the 29 keypunch, press the key that has the minus sign.
8. Press the REL key to release the card.
9. Press the REG key to register the card at the reading station.
10. Press the REL key to release the card.
11. Press the REG key to place the card in the stacker.
12. Turn off the main-line switch.

Procedure for Duplicating a Damaged Card

By using the card produced by the preceding procedure, duplicate the card by the following procedure.

Objective: A card is to be duplicated because it has been nicked and fails to feed through the data processing machines.

1. Turn on the main-line switch and press the REL key.
2. Turn off the functional switches and program control.
3. Place the card to be duplicated into the notches on the plastic guides at the reading station (Fig. 4–5). Slide the card as far as possible toward the reading station until the card stops. Then pull the card to the right about $\frac{1}{4}$ inch. It is not necessary to put the right-hand portion of the card beneath the guides. The card may be damaged further if this is attempted.
4. Place the blank card into the guides at the punching station. Slide the card to the left until it stops, and then pull it back about $\frac{1}{4}$ inch, making sure it is flat in the card bed.
5. Press the REG key. This will register both cards.
6. Press the DUP key until the entire card has been duplicated. If many card columns are unpunched on the right edge of the original card, it might be faster for the operator to press the REL key after the last column that contains punching has been punched.
7. Press the REG key to stack the nicked card and register the duplicated card at the reading station.
8. Press the REL key and then the REG key to stack the duplicated card.

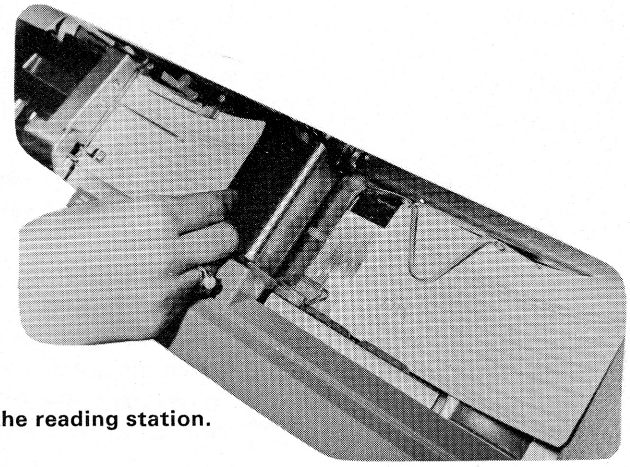


Fig. 4–5 Positioning a card at the reading station.

9. Sight check the cards to guarantee the accuracy of the duplicated card. Destroy the nicked card.
10. Turn off the main-line switch.

If the original card is more than slightly nicked, it may be necessary to reshape the card to remove a crease or wrinkle. Many times a fingernail is a handy tool to remove nicks or creases.

Procedure for Correcting Cards

Punch a card with the following data. Punch 12345 in card columns 1 through 5. In card columns 21 to 25, punch 12530. Use this card as the incorrect card and follow the procedure below.

Objective: A card contains the customer number in card columns 1 through 5 and the sales amount in card columns 21 through 25. The customer number is punched 12345 and is correct as punched. The sales amount is punched 12530 and should have been punched 12350. Card columns 23 and 24 are incorrectly punched. Card column 23 should contain a 3 punch and 24 should contain a 5 punch. See Fig. 4–6.

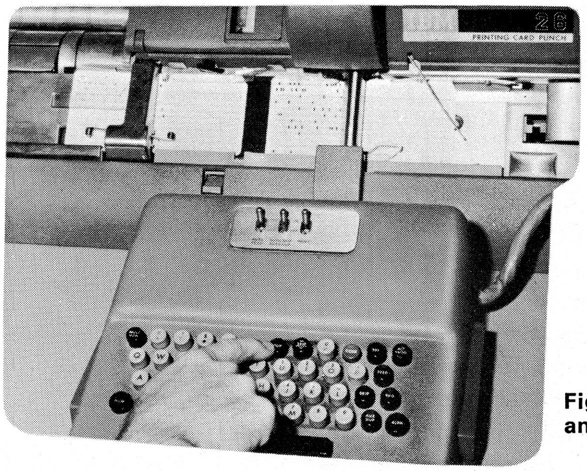


Fig. 4–6 Example of an incorrect card and the correct card to be punched.

1. Turn on the main-line switch and then depress the REL key.
2. Turn off the functional switches and program control.
3. Place the card that contains the error into the notches on the plastic guides at the reading station. Slide the card as far as possible toward the reading station until the card stops. Then pull the card to the right about $\frac{1}{4}$ inch. It is not necessary to place the right hand portion of the card beneath the guides. The card may be damaged further if this is attempted.
4. Place a blank card into the guides at the punching station. Slide the card to the left until it stops and then pull it back about $\frac{1}{4}$ inch, making sure it is flat in the card bed.
5. Press the REG key. This will register both cards.
6. Press the DUP key until card column 23 is read by the column indicator.
7. While holding down the numeric shift key, depress the 3 key and then the 5 key.
8. Depress the DUP key until the 0 in card column 25 has been punched.
9. Depress the REL key to release the cards.
10. Depress the REG key to stack the error card and register the correct card at the reading station.
11. Press the REL key and then the REG key to stack the correct card.
12. Sight check the duplicated card columns to guarantee their accuracy and then check the correct columns to ensure that they were punched correctly. Be sure to destroy the error card.
13. Turn off the main-line switch.

LABORATORY ASSIGNMENTS

Punching a Card

1. Keypunch your name, last name first, into card columns 1 through 25.
2. Keypunch your street address into card columns 31 through 65.
3. Keypunch today's date into card columns 71 through 76.
4. Keypunch an X control punch into card column 80.

Duplicating a Card

1. Duplicate the card from the preceding laboratory assignment.

Correcting a Card

1. Correct the card from the preceding laboratory assignment to contain the week-ending date (Sunday) instead of today's date.
2. Eliminate the X control punch from card column 80.

REMOVING CARD JAMS AND UNLOCKING THE KEYBOARD

Removing Card Jams from the Punching Station

To release a card jammed in the punching station, the following procedure should be used:

1. Turn off the main-line switch and open the program unit cover (Fig. 4–7).

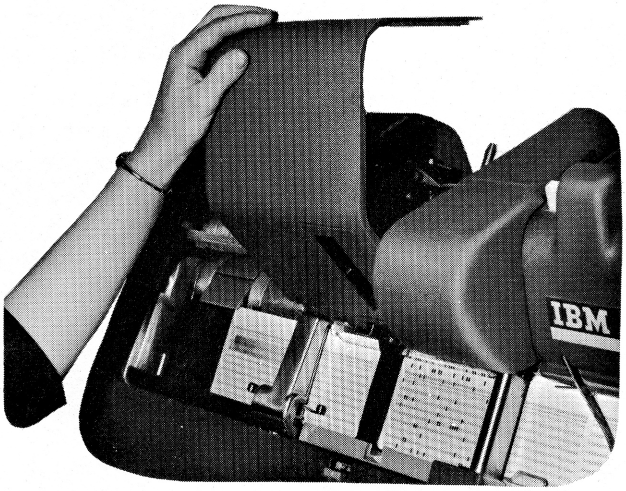


Fig. 4–7 Opening the program unit.

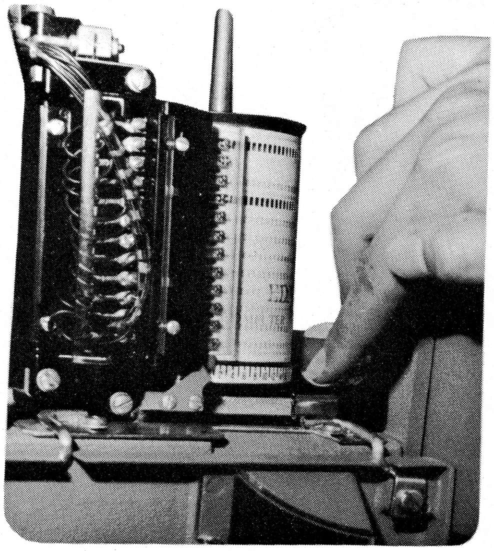


Fig. 4–8 Depressing the pressure roll release lever.

2. Depress the pressure roll release lever (Fig. 4–8) to release pressure on the card at the punching station.

3. The jammed card may be removed from the punching station by pulling the card gently to the right or left (Fig. 4–9).

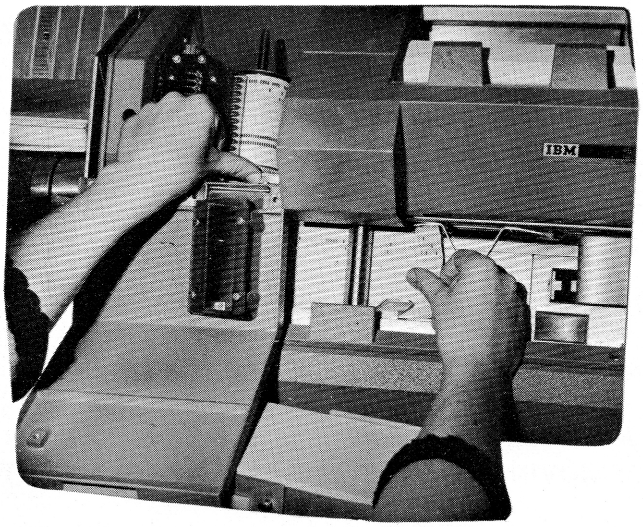


Fig. 4–9 Removing a card at the punching station.

4. If the card is difficult to remove, turn on the main-line switch, press the REG key, and then press the pressure roll release lever.
5. If the card still cannot be removed, depress the MULT PCH key while striking all the numeric keys. Then push on the pressure roll release lever and pull on the card. In almost all cases the card can now be removed. If the card is still jammed, notify the instructor.
6. Replace the program unit cover and resume operation.

If a card is torn apart in an attempt to remove it, machine operation cannot resume until the torn part is removed from beneath the punching station. While pushing on the pressure roll release lever, a small piece of card can be inserted into the punching station, and by pushing it back and forth, the rest of the jammed card should come out. See Fig. 4–10. Sometimes a special card knife can be utilized to remove pieces of cards on the 26 keypunch. See Fig. 4–11.

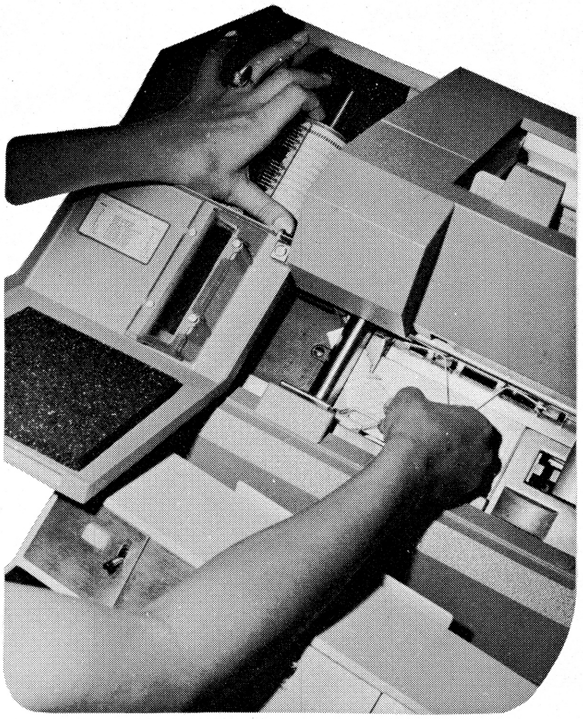
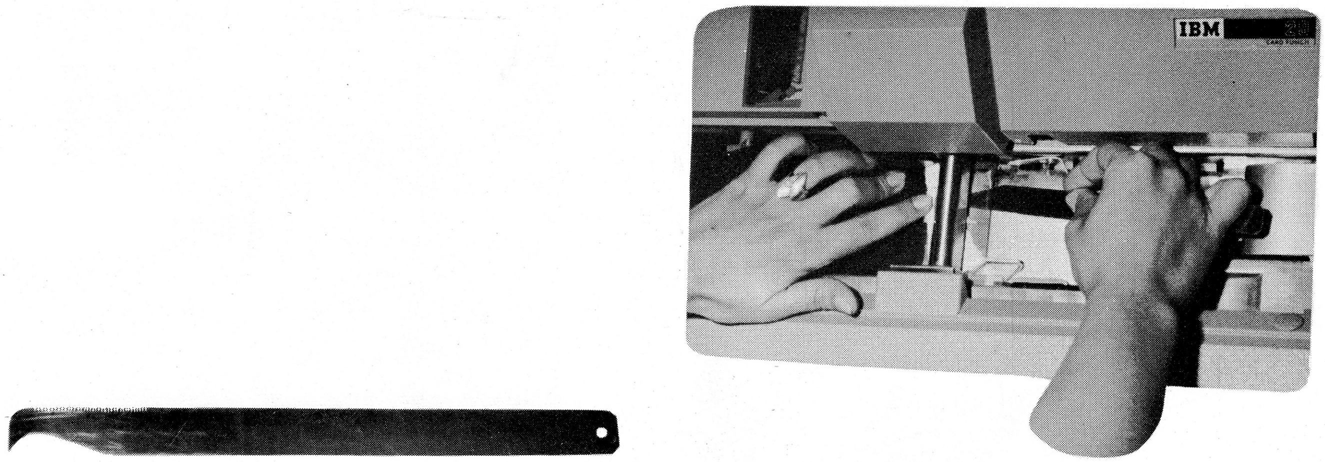


Fig. 4–10 Using a card to remove jams.



A

B

Fig. 4–11 **A, card knife; B, using a card knife.**

Removing a Card Jammed in the Reading Station

To release a card jammed in the reading station, the following procedure should be used:

1. Open the program unit cover by lifting it toward the operator.
2. Depress the pressure roll release lever to release pressure on the card at the reading station. Usually the card will be sent to the left of the reading station as soon as the pressure roll release lever is depressed. However, if the card fails to move, it can be pulled gently from right or left until free. See Fig. 4–12.

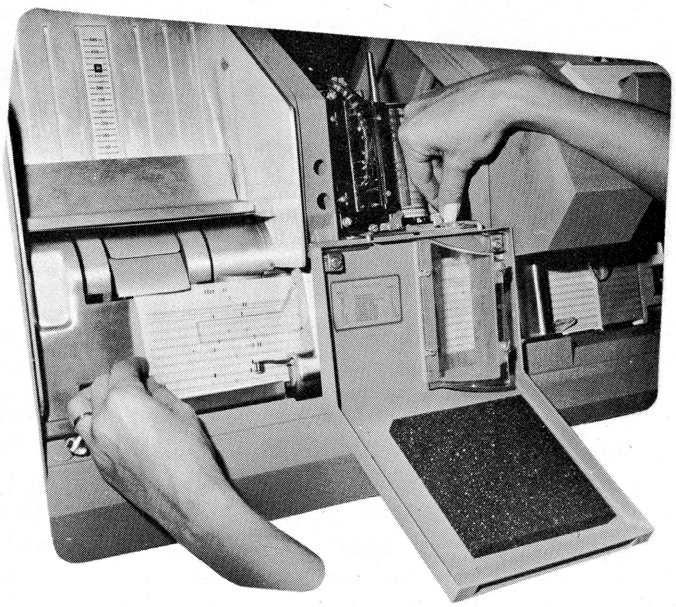


Fig. 4–12 **Removing a card at the reading station.**

Removing Card Jams from the Card Feed Unit

To release a card jammed from the card feed unit, the following procedure should be used:

1. Raise the print unit cover until it rests in an open position (Fig. 4–13).

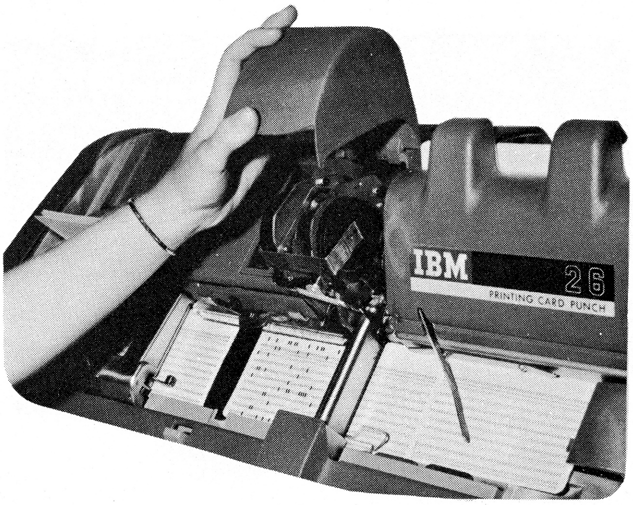
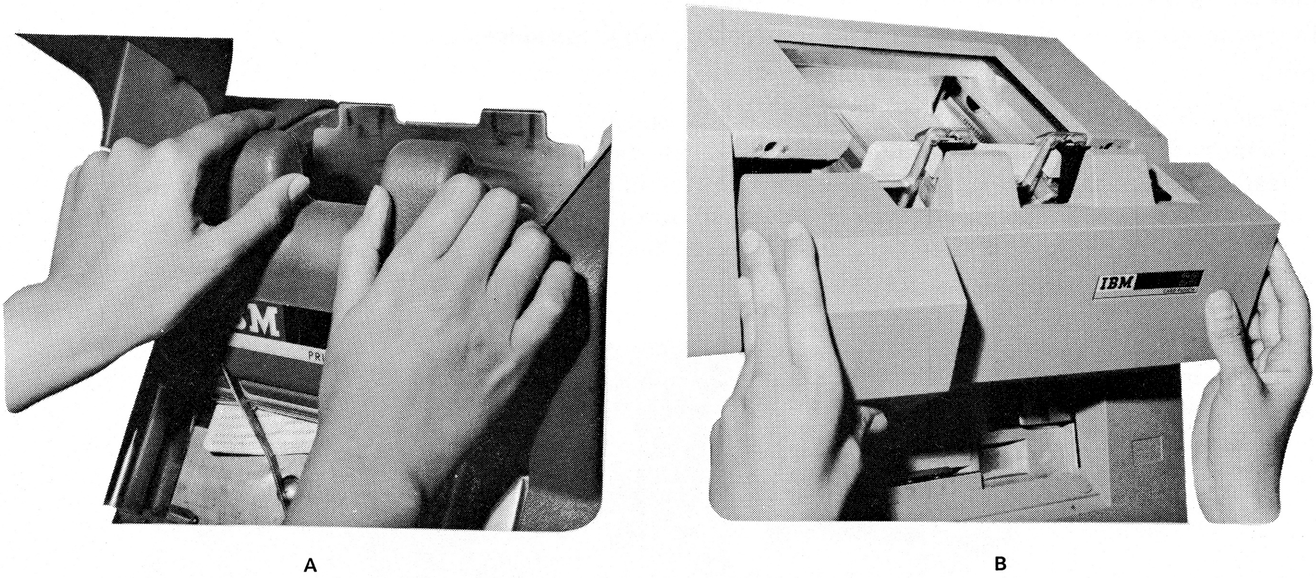


Fig. 4–13 Opening the print unit cover.

2. Remove the card feed unit cover (Fig. 4–14) by holding the cover firmly and pulling the cover toward the operator.



A

B

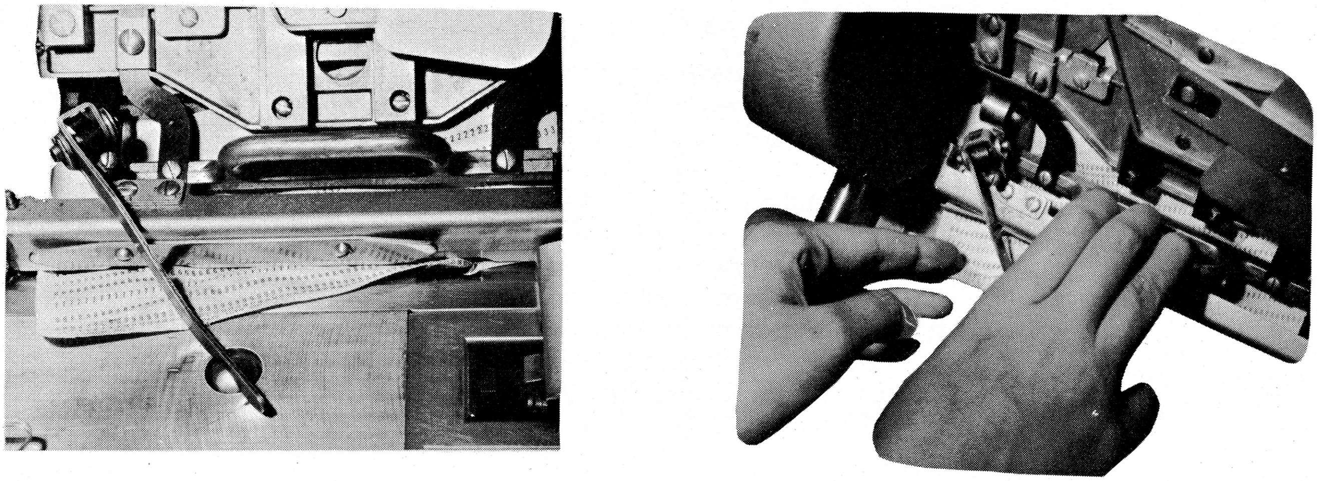
Fig. 4–14 Removing the card feed cover.
A, 26 keypunch; B, 29 keypunch.

3. Pull the handle at the bottom of the feeding unit toward the operator to remove pressure on the cards on the card feed unit. Remove the jammed cards from the top or bottom of the card feed unit as required (Fig. 4–15).
4. Replace the cover on the card feed unit by fitting the card feed pressure finger into the notch at the bottom of the cover and align the cover with the card feed unit, making sure the two round knobs at the top of the cover fit into their respective holes. Snap the cover into place.
5. Lower the print unit cover.

Unlocking the Keyboard

The keyboard will become locked under any of the following conditions:

1. If the register key or the feed key is depressed while a card is registered at the



A

B

Fig. 4–15 A, Jammed card at the feed unit; B, releasing pressure on a jammed card in the feed unit.

punching station. To unlock the keyboard: On a 26 keypunch, depress either the release or the backspace key; on a 29 keypunch, press the error reset key.

2. If an alphabetic key, other than a combination key, is depressed in a field programmed for numeric punching. To unlock the keyboard: On a 26 keypunch, one of the following three methods may be utilized, depending upon the operation: (a) Depress the backspace key, and then press the space bar to move to the next column; (b) depress the release key to release the card without punching; (c) depress the alpha shift key if the alphabetic character is to be punched. On a 29 keypunch, press the error reset key to unlock the keyboard.
3. If the main-line switch is turned off and then on while a card is registered at the punching station. To unlock the keyboard: On a 26 keypunch, depress the release key. On a 29 keypunch: (a) Use the clear switch to move the card to the stacker if it is to be removed; (b) if it is not to be removed, depress the feed key to bring down a second card, register the first card, and restore the machine to operation.
4. If a blank column is duplicated in a field programmed for numeric punching. This acts as a blank-column detection device to ensure that a digit is punched in every column of a numeric field that is being duplicated. To unlock the keyboard: On a 26 keypunch, depress the backspace key or the alpha shift key; on a 29 keypunch, depress the error reset key or the alpha shift key.
5. If a card is not registered at the punching station. Punching or spacing cannot be accomplished unless a card is in position to be punched. When the automatic feed switch is on, either the register, feed, or release key can be depressed to move a card into punching position.

LABORATORY ASSIGNMENTS

1. Register a card at the punching station and then release it by means of the pressure roll release lever.
2. Register a card at the reading station and then release it by means of the pressure roll release lever.
3. Practice removing and replacing the card feed unit cover from the keypunch machine. Lift up on the handle to see how it functions. Do you think you could remove a card that has been jammed at this location?
4. Turn to the Appendix and do the punching assignments indicated by your instructor.

REVIEW QUESTIONS

1. What three operations do not require program control?
2. What is sight checking?
3. Describe the procedure used to punch a single card.
4. Describe the procedure used to duplicate a card.
5. Describe the procedure used to correct a card that contains a keypunching error such as a transposition.
6. Describe the removal of a card jammed at the punching station.
7. How is a card removed that is jammed at the reading station?
8. How is a card removed that is jammed at the card feed unit?
9. List five ways in which the keyboard may become locked.
10. How may the keyboard be unlocked?

QUESTION CARDS

Figures 4–16 through 4–19 contain questions that are to be interpreted. Write the question and the answer to the question on a separate sheet of paper.

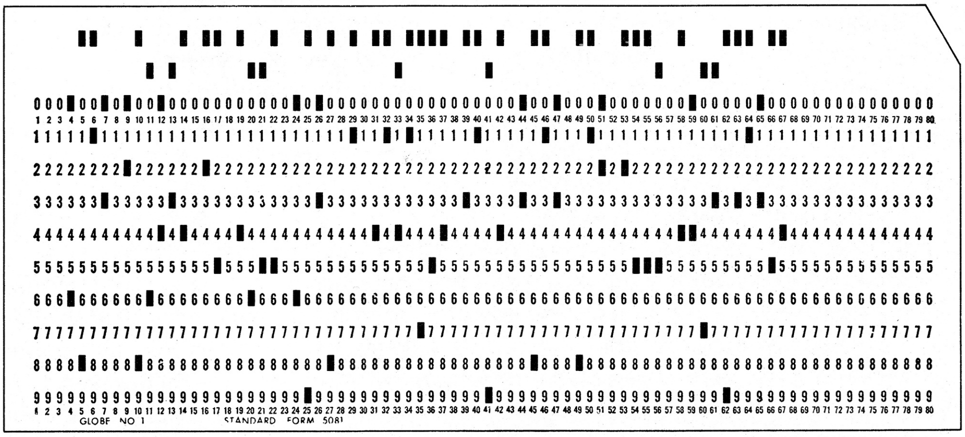


Fig. 4–16

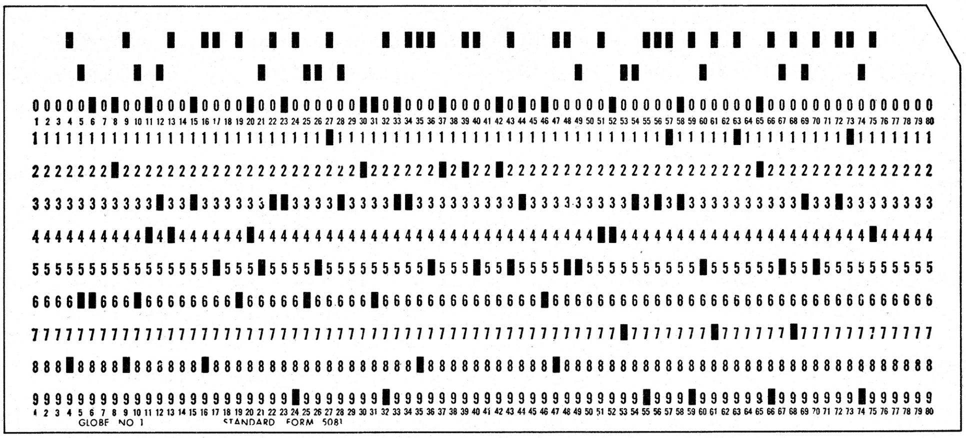


Fig. 4–17

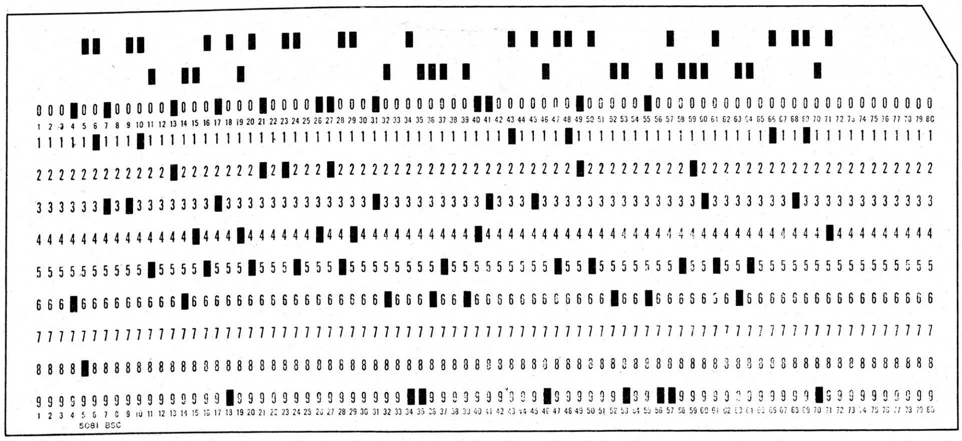


Fig. 4–18

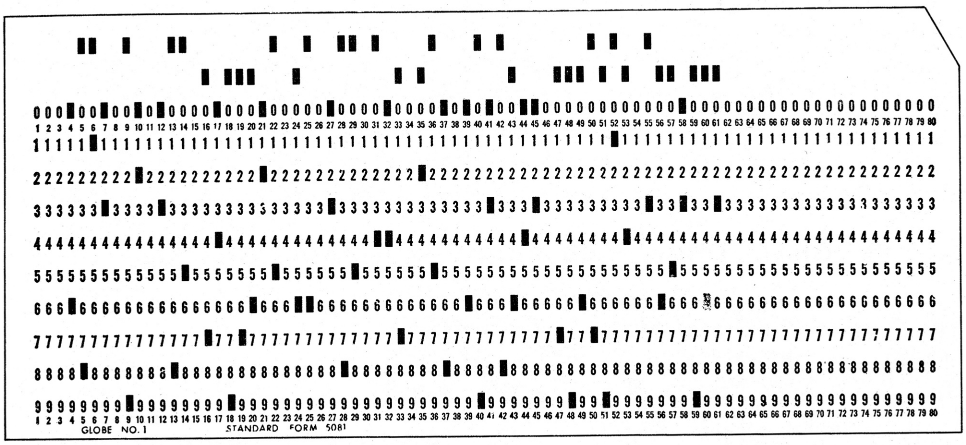

GLOBE NO. 1
STANDARD FORM 5081

Fig. 4–19

chapter 5 PROGRAMMING THE KEYPUNCH

THE PROGRAM DRUM AND BASIC PROGRAM CONTROL

The Component Parts of the Program Unit

The purpose of the program unit is to allow certain repetitive operations to be accomplished automatically. The program unit controls automatic skipping over columns that are to remain unpunched, automatic duplicating of repetitive information, and shifting from numeric mode to alphabetic mode and back again.

The four components of the program unit are as follows:

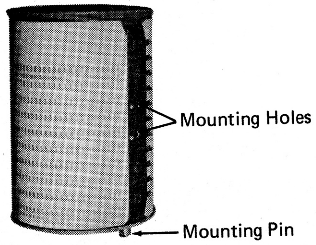


Fig. 5–1 Program card on drum.

1. *Program card.* The program card (Fig. 5–1) contains punching that causes each of the automatic operations to occur when detected by the reading devices called starwheels. The simplest program card is a blank card. With a blank card on the program drum and program control on, the keypunch is placed in numeric shift.
2. *Program drum.* The program card is mounted on the program drum (Fig. 5–2). The program drum contains 12 grooves into which a starwheel is allowed to drop when it detects a hole. Each starwheel, through an internal connection, causes the keypunch to perform a particular automatic operation.
3. *Starwheel.* The starwheel (Fig. 5–3) is the sensing or reading mechanism that detects the holes in the program card.
4. *Program control lever.* The program control lever is used to raise or lower the

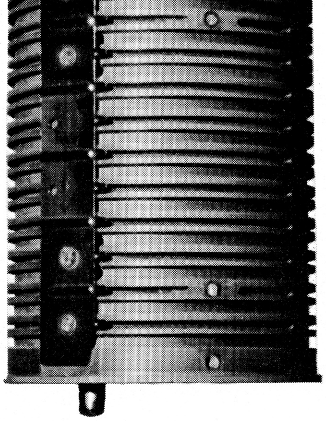


Fig. 5–2 Program drum.

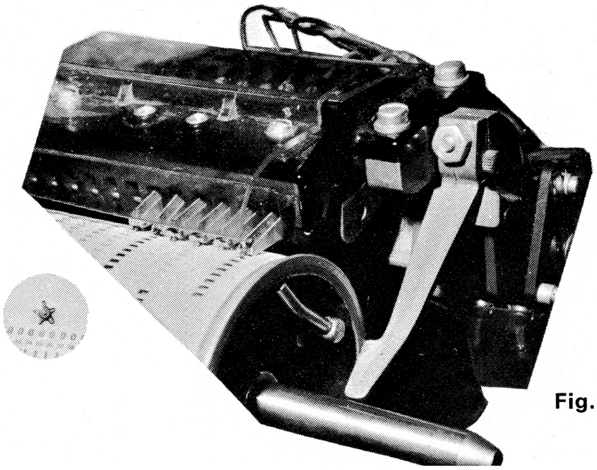


Fig. 5–3 Starwheels.

starwheels. When the starwheels are lowered onto the program card, program control is on and the machine is in numeric shift. When the starwheels are raised from the program card, program control is off and the machine is in alphabetic shift.

As each punching key is depressed and the cards at the punching and reading station move forward to the next card column, the program drum also moves so that the program card can control the automatic operations being performed column for column.

It should be noted that if there is no card on the program drum and the starwheels are down, all the starwheels will drop within the grooves of the program drum and each one will give off impulses as though they have detected a punched hole. These impulses, all given at the same time, could cause internal damage to the keypunch, and it is therefore good practice to have a card mounted on the program drum at all times.

Mounting a Card on the Program Drum

1. Depress the program control lever to raise the starwheels (Fig. 5–4). **Always raise the starwheels before removing the program drum.** If the program drum is removed with the starwheels down, they will probably be torn free. A keypunch without starwheels cannot be used for any operation requiring program control.

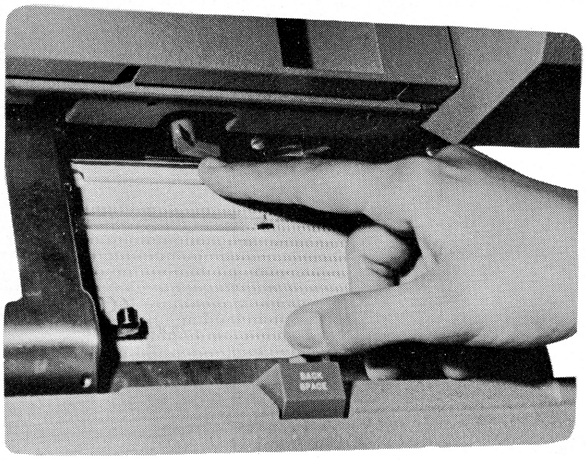


Fig. 5–4 Raising the starwheels.

2. Lift the cover containing the program unit by raising the back edge of the cover toward the operator (Fig. 5–5).

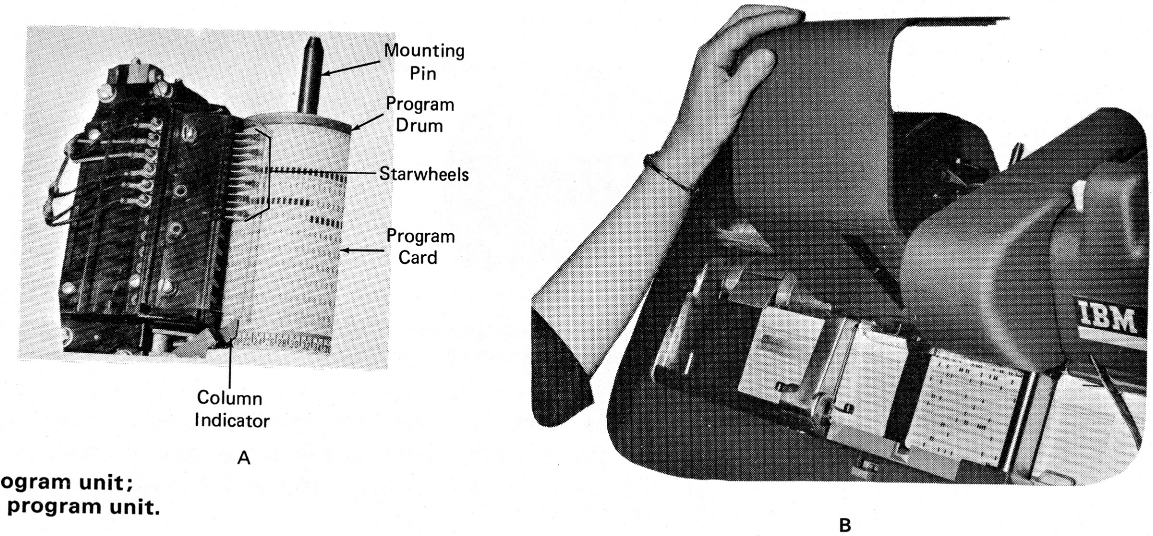


Fig. 5–5 A, Program unit; B, opening the program unit.

3. Remove the program drum (Fig. 5–6).

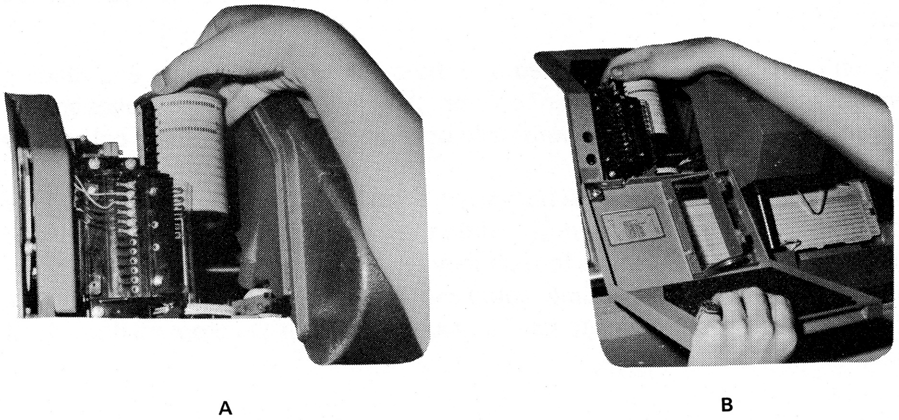


Fig. 5–6 Removing the program drum. A, 26 keypunch; B, 29 keypunch.

4. With the clamping strip facing the operator, move the clamping strip handle counterclockwise as far as possible. See Fig. 5–7.

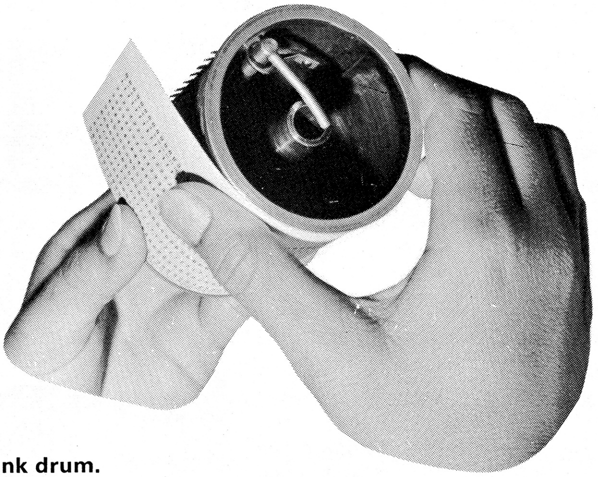


Fig. 5–7 Placing a card on a blank drum.

5. Insert the column 80 edge of the card under the smooth edge of the clamping strip (Fig. 5–8).

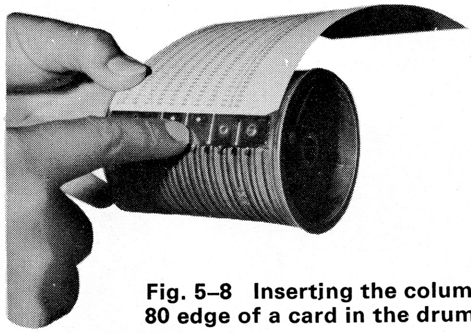


Fig. 5–8 Inserting the column 80 edge of a card in the drum.

6. Check the alignment of the card through the alignment check holes. The card should fit flush against the metal edge under the strip. To lock the card under the smooth edge of the clamping strip, turn the clamping strip handle to the center position (Fig. 5–9).

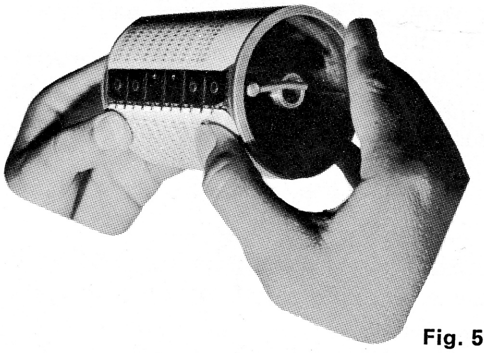


Fig. 5–9 Locking the card on the drum.

7. Wrap the card tightly around the drum and insert the column 1 edge of the card under the toothed edge of the clamping strip, and lock by turning the clamping strip handle clockwise as far as possible. Be sure to check the 9 edge of the card. It must be flush against the bottom rim. The card must be tight on the drum. If it is loose on the drum, it will not be read properly by the starwheels. Check the alignment holes. The card must be flush against the metal plate beneath the clamping strip.
8. When replacing the drum, hold it so that the metal clamping strip is facing toward you. Slip it onto the drum rod and with a slight amount of pressure downward, rotate the drum clockwise. When the aligning pin finds its receptacle, the drum should drop into position. The drum should be flush against the column indicator.
9. Press the release key to fully engage the reading mechanism, and then set the functional switches.

Placing the Cards in the Hopper

1. Joggle and align the cards.
2. Push the pressure plate backward away from the operator until it locks into place.
3. Place the cards into the hopper, 9 edge down and faced toward the operator.
4. Release the pressure plate and let it come to rest against the cards.

Procedure for Using Program Control When Punching All-Numeric Information

Objective. Cards that contain customer number, salesman number, item number, and sales amount are to be keypunched. The customer number is punched in card columns 1 through 5, the salesman number in card columns 6 through 10, the item number in card columns 12 through 16, and the sales amount in card columns 17 through 21 (Fig. 5–10).

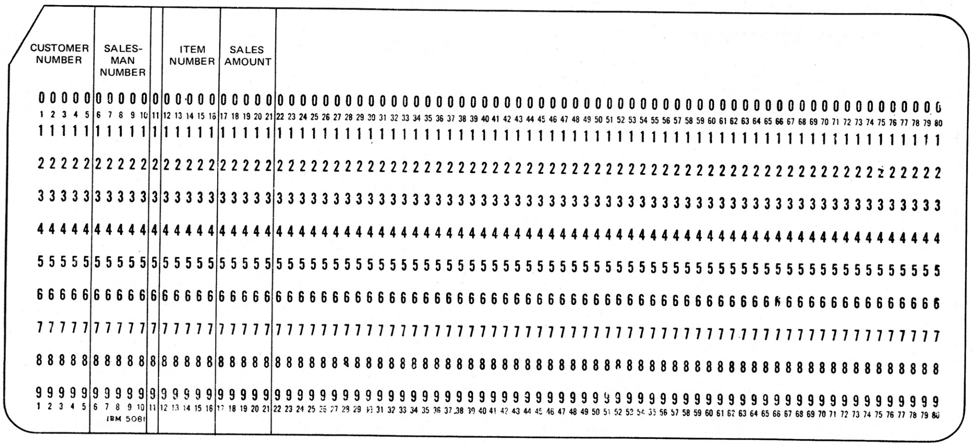


Fig. 5–10 Card example.

1. Turn on the main-line switch and then depress the REL key.
2. Joggle the blank cards and place them in the hopper.
3. Turn on the auto feed and the print functional switches.
4. Raise the starwheels and remove the program-drum.
5. Place a blank card on the program drum and return the drum and card to the program unit.
6. Lower the starwheels.
7. Feed two cards from the hopper.
8. Punch the customer number, taking care to place leading zeros in the field if necessary. (If the keyboard should lock at any time, refer to Chapter 4, "Unlocking the Keyboard.")
9. Punch the salesman number.
10. Depress the space bar to space over card column 11.
11. Punch item number and sales amount, taking care to place leading zeros where needed.
12. Release the card.
13. Start punching the next card.

LABORATORY ASSIGNMENTS

1. Prepare the card illustrated in Fig. 5–10 by following the instructions in the text.
2. Turn to the Appendix and do the punching assignments indicated by your instructor.

CODING THE PROGRAM CARD

Skipping, duplicating, and shifting are all functions of the program control. Each of these functions is made possible by a specific punch in a program card. As previously mentioned, the keypunch program unit controls automatic skipping over columns not to be punched, automatic duplicating of repetitive data from the card at the reading station into the card at the punching station, and shifting from numeric data to alphabetic data and vice versa. The basic program card is completely blank and when placed on the program drum puts the keypunch into a numeric mode. Each row of punches in the program card controls a specific function. The following coding is for the 26 keypunch and for program one of the 29 keypunch. Alternate programming for the 26 and program two coding will be handled separately.

Field Definition. 12 punch. A 12 punch is placed in every card column of a field *except* for the first column. The 12 punch serves to continue any skip or duplication started in the first card column of the field to the end of that field. For example, if card columns 1 through 5 are to be programmed for numeric punching, the program card would be punched as in Fig. 5–11. A field consisting of a single column should not be programmed with a 12 punch.

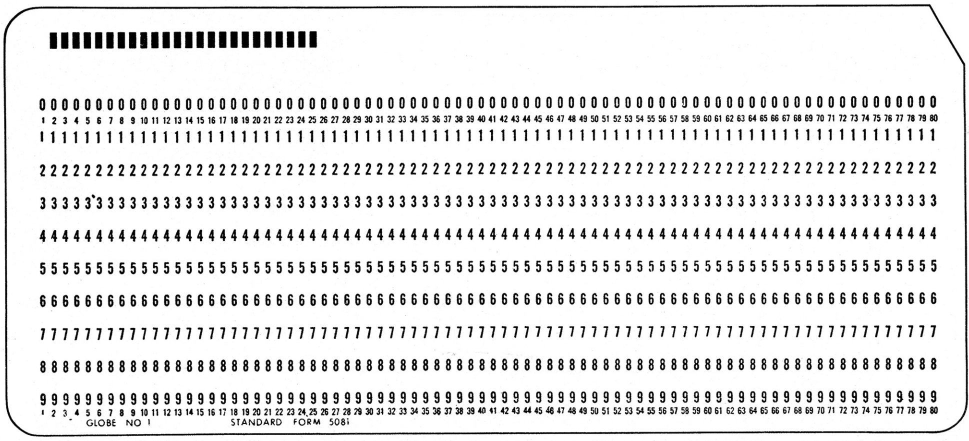


Fig. 5–11 Defining the field.

The following codes are punched in the first card column of the field.

Automatic Skip. 11 punch. An 11 punch is placed in the high-order position of any field that is to be skipped automatically by means of program control.

Skipping is allowed to continue over that field by the 12 punches in the remaining columns of the field. The auto skip dup switch must be on in order for automatic skipping to be effective. See Fig. 5–12 for an example of automatic skip coding.

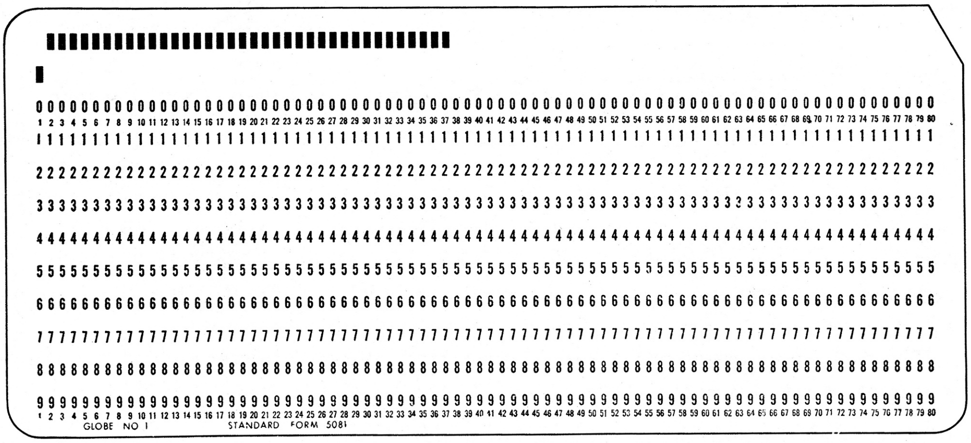


Fig. 5–12 Automatic skipping.

Automatic Duplication. 0 punch. A 0 punch is placed in the high-order position of any field that is to be duplicated automatically. Duplication is continued over that field by the 12 punches in the remaining columns of the field. The auto skip dup switch must be on. See Fig. 5–13 for an example of automatic duplication coding.

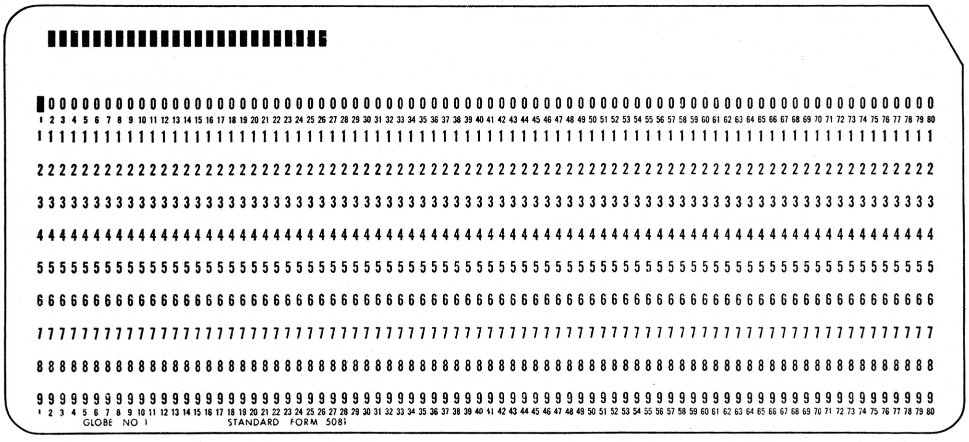


Fig. 5–13 Automatic duplication.

Alphabetic Shift. 1 punch. The combination keyboard is normally in numeric shift when the program control is on, and depression of a combination key causes a

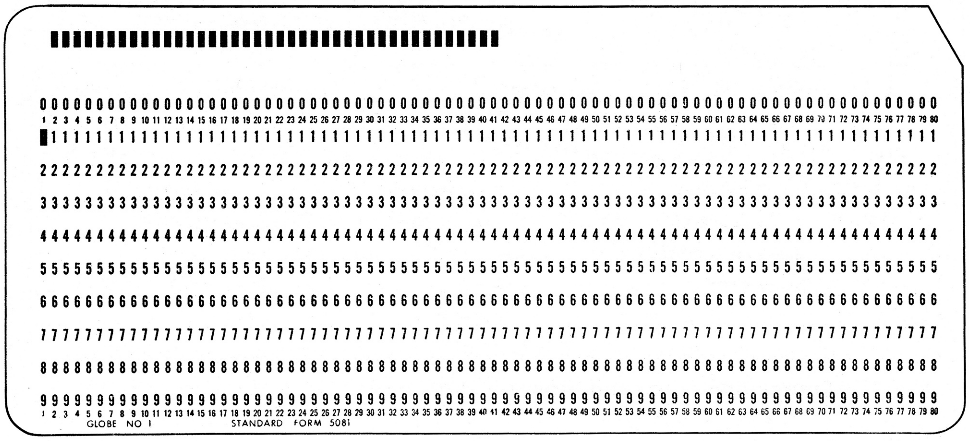


Fig. 5–14 Alphabetic shift.

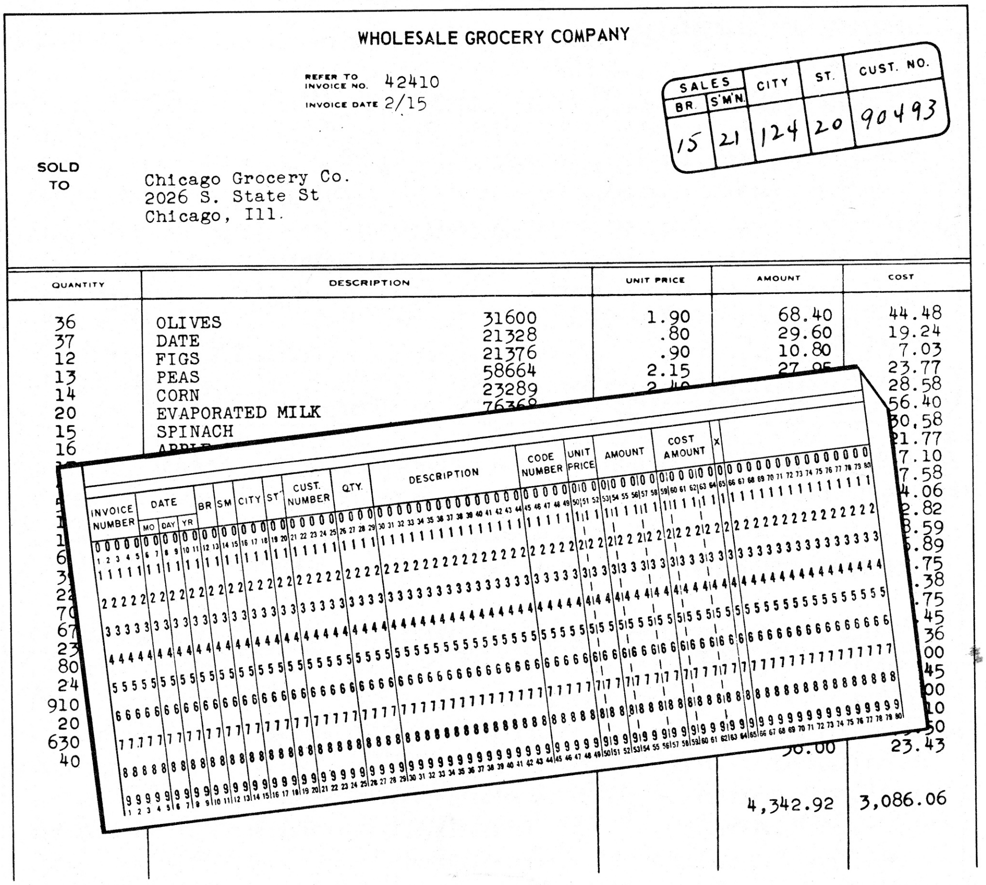
number to be punched. To punch a letter, the keyboard must be shifted to the alphabetic punching mode. This shifting is done automatically by a 1 punched in the program card for each column of the alphabetic field. A 12 punch in each card column is still needed for field definition. When duplicating alphabetic information, the 1 punches permit automatic spacing over blank columns and prevent skipping when letters containing 11 punches are duplicated. See Fig. 5–14 for an example of program coding for an alphabetic field and also for an alphabetic field programmed for automatic duplication.

Analyzing the Source Document to Determine Program Card Coding

Prior to designing a program card, a thorough analysis of the source document and the cards to be punched from the data it contains is necessary. Remember that a program card should be planned so that a job is allowed to operate as efficiently as possible. All fields to be duplicated should be done so automatically, not manually. Fields to be skipped should be done automatically as well. The more efficient the program, the faster the keypunch operator can finish the job. See Fig. 5–15 for an example of a source document and a card to be punched from it.

The following questions should be ansered to help determine the necessary program coding for Fig. 5–15:

1. What alphabetic information is to be punched?
2. What fields will be common to all cards and may be duplicated?
3. What fields are to be punched manually in numeric shift?
4. What fields from the source document will not be keypunched?
5. What card columns are to be skipped?



WHOLESALE GROCERY COMPANY

REFER TO INVOICE NO. 42410
INVOICE DATE 2/15

SALES BR.	SALES S'M'N.	CITY	ST.	CUST. NO.
15	21	124	20	90493

SOLD TO
Chicago Grocery Co.
2026 S. State St
Chicago, Ill.

QUANTITY	DESCRIPTION		UNIT PRICE	AMOUNT	COST
36	OLIVES	31600	1.90	68.40	44.48
37	DATE	21328	.80	29.60	19.24
12	FIGS	21376	.90	10.80	7.03
13	PEAS	58664	2.15		23.77
14	CORN	23289			28.58
20	EVAPORATED MILK				56.40
15	SPINACH				
16					
24					
910					
20					
630					
40					23.43
				4,342.92	3,086.06

Fig. 5–15 Source document and program card.

The answers to these questions are as follows:

1. Description
2. Invoice number, invoice date, branch, salesman, city, state, customer number, and X punch
3. Quantity, code number, unit price, amount, and cost amount
4. Store name and address
5. Card columns 66 through 80

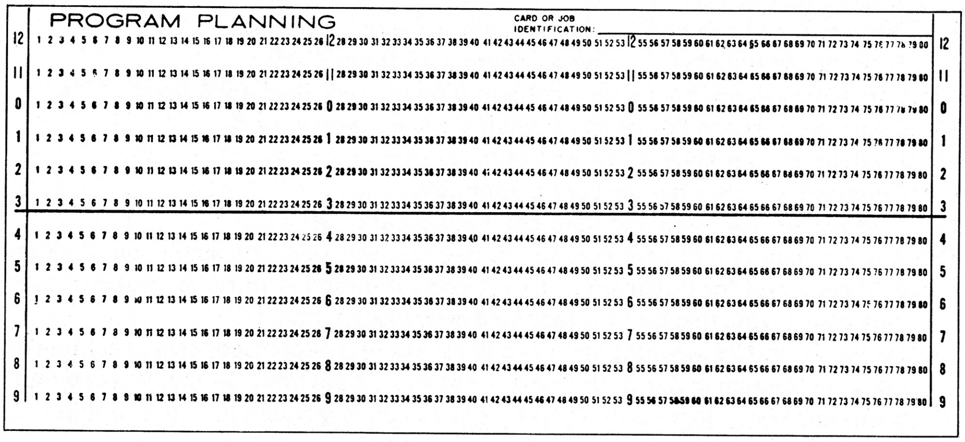


Fig. 5–16 Program planning card.

After the answers have been determined, the program card can be planned in detail. This is generally done by using a program planning card, shown in Fig. 5–16. The proper program codes are illustrated by darkening the appropriate punching positions. Figure 5–17 is the program planning card that illustrates the previous example of an invoice job. After the card has been planned, the next step is to punch the program card. The procedure in punching the program card is as follows:

1. Raise the starwheels.
2. Insert a blank card at the punching station.
3. Register the card.
4. Depress the numeric shift key and depress the 0 key to punch a 0 in card column 1.
5. Depress the numeric shift key, and while holding it down, depress the P or ampersand key. This will cause a 12-zone punch to be placed in card column 2.
6. Repeat punching 12's up to and including card column 25. Because all fields from invoice number to quantity are to be duplicated, consecutive fields can be programmed as a single field. It should be noted, however, that a thorough

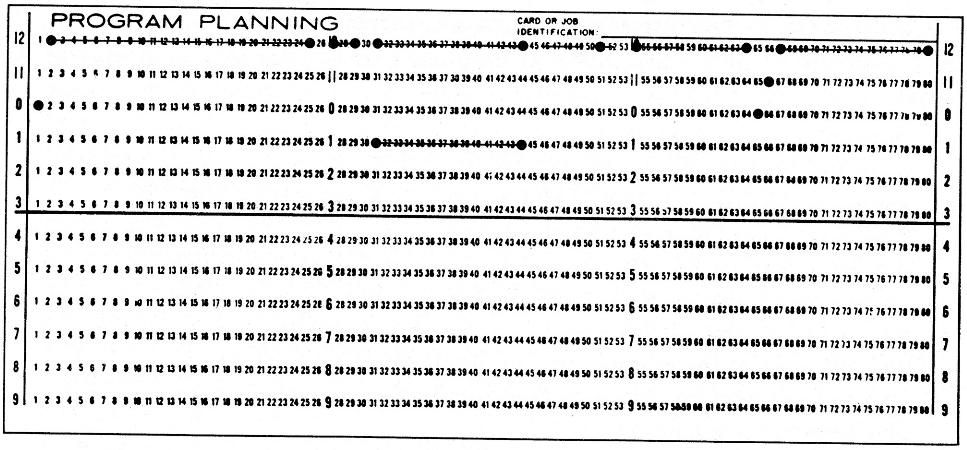


Fig. 5–17 Example of use of a program planning card.

study of the source document is in order before it can be determined that consecutive fields should be programmed as one field.

7. Space over card column 26. This is a numeric field for manual punching.
8. Twelves are punched in card columns 21 through 29.
9. A 1 is punched in card column 30.
10. The letter A is punched in card columns 31 through 44 and will give the necessary 12 and 1 punch in each card column. This method is far easier and faster than holding down the multiple punch key and then depressing the ampersand key and the 1 key.
11. Depress the space bar for card column 45, a numeric field.
12. Twelves are punched into card columns 46 through 49.
13. Depress the space bar for card column 50, a numeric field, followed by 12's.
14. Depress the space bar for card column 53, a numeric field.
15. Twelves are punched into card columns 54 through 58.
16. Depress the space bar for card column 59.
17. Twelves are punched into card columns 60 through 64.
18. A 0 is punched into card column 65 because this field is a single card column field designed for duplication. (An X control punch is to be recorded in each data card.) Note that no 12 is recorded after the 0 punch.
19. On the 24 and 26 keypunches, the dash skip key is depressed for card column 66 because the remainder of the card is not to be punched. On the 29 keypunch, the minus key is depressed. The 11-zone punch is required to initiate a skip.
20. Twelves are punched into card columns 67 through 80.

After the program card has been keypunched (Fig. 5–18), it should be checked for accuracy of punching and then placed on the program drum.

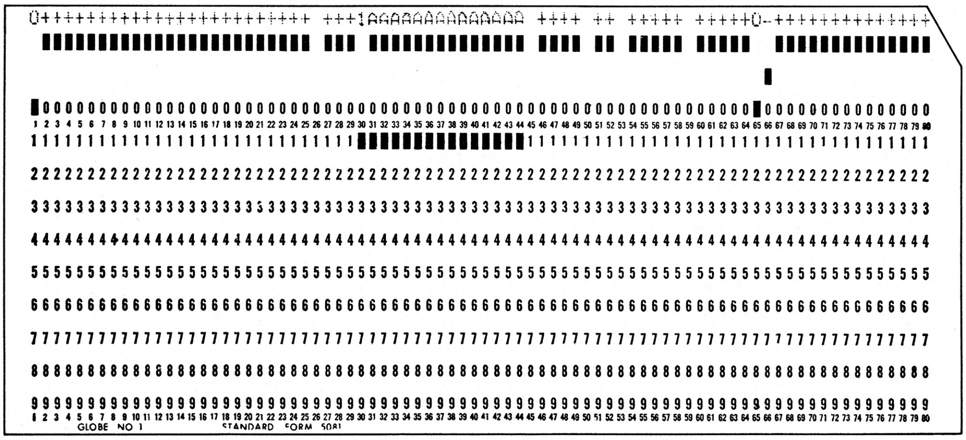

0++++++++++++++++++++++++ +++1AAAAAAAAAAAAAA ++++ ++ +++++ +++++0-++++++++++++++
GLOBE NO 1
STANDARD FORM 5081

Fig. 5–18 Example of a finished program card.

Procedure for Punching with Program Control

To punch the invoice cards utilizing program control, the following should be used:

1. Put the program card on the drum, place the cards in the hopper, turn on the main-line switch, lower the starwheels, press the REL key, and wait for the keypunch to warm up (24 and 26 keypunches only).
2. Turn on the auto feed switch. Turn off the auto skip dup switch. The auto skip dup switch must be off because there is nothing to duplicate at the reading station. Only after the first card has been punched and registered at the reading station should the auto skip dup switch be turned on. If the switch were on and no card were at the reading station, the keyboard would lock.
3. Depress the feed key twice to feed two cards from the hopper and cause the first card to be registered.

4. Punch the invoice number—42401.
5. Punch the date, being careful to place in leading zeros—021569.
6. Punch branch, salesman, city, state, and customer number—15211242090493. Check to see that the column indicator is at column 26.
7. Record the quantity—0036.
8. Punch description—OLIVES.
9. Because OLIVES is only six card columns in length, the column indicator will be resting on column 36. To reach the proper card column, it will be necessary to depress the skip key. The indicator will now be resting on column 45. Check to make sure. It is important for the operator to remember that she must always manually skip the remainder of an unused alphabetic field or the rest of the card will be punched in the wrong card columns.
10. Punch the code number—31600.
11. Record the unit price—190.
12. Punch the amount—006840.
13. Punch the cost amount—004448.
14. Depress the dash skip key to record an X punch in card column 65.
15. At this time the information to be duplicated (card columns 1 through 25) should be thoroughly checked to guarantee its accuracy. Remember that if an error is recorded on the very first card, this error will be duplicated into all cards. Now is the time to correct the error, not after all the cards have been punched.
16. Turn on the auto skip dup switch. The remainder of the card will be skipped, the card will be released and sent to the reading station where it will be registered, another card will be fed from the hopper, the card in the punch bed will be registered, and the first 25 columns will be automatically duplicated. All this will be accomplished when the switch is turned on.
17. The remainder of the first card should be checked to make sure all data were recorded in the proper columns, including the X punch in card column 65.
18. The quantity, 0037, can now be recorded on the "dates" card, the second card on the list.

From this point on punching can proceed at a very rapid rate, taking care to manually skip the unused card columns of the description field and also being sure to place leading zeros into fields wherever necessary.

Procedure for Correcting Errors

If an error in punching is sensed by the operator, the following procedure should be used:

1. Release the error card from the punching station. The keypunch is designed so that any information is duplicated even though the card is released. This feature prevents the loss of data that would have to be manually rekeyed again.
2. After releasing the error card, take a pencil or pen and mark it with a large X to identify it. It must be removed later and this can be done with ease if it is marked. Too often the error card is allowed to remain in the deck, causing problems later on.
3. Depress the DUP key to duplicate each correct field on the error card. There is no sense in manually repunching the entire card when some of it is correct.
4. Upon reaching the field containing the error, rekey the field manually and continue punching the card. Any fields will be duplicated from the error card since it contains the data to be duplicated.
5. *Left-zero insertion field* (29 keypunch, Model B only). Errors recognized or sensed by the operator while keying a left-zero field are corrected by pressing the error reset key. In a left-zero field, these keyed digits do not punch in the card as they are keyed; they enter into a storage device. Pressing the error reset key clears storage and erases all stored digits. The correct data can then be rekeyed.

Additional Program Card Coding—26 Keypunch Only

Left-Zero Printing. 2 punch. With program control effective, the 26 keypunch will not print zeros to the left of the high-order significant digits in a numerical field unless a special code is placed in the program card. To print these zeros, a 2 must be punched in each column of the field in the program card. A 12 punch must also appear in each card column for field definition. Zero in the units positions of a field will always print unless all printing is suppressed, as explained next. See Fig. 5–19.

Print Suppression. 3 punch. When the print switch is on, printing normally occurs for each column that is punched. Printing can be suppressed by punching a 3 in the program card for each column in which print suppression is desired. A 12 punch must also appear in each card column for field defnition. See Fig. 5–19 for an example of program coding a field for print suppression.

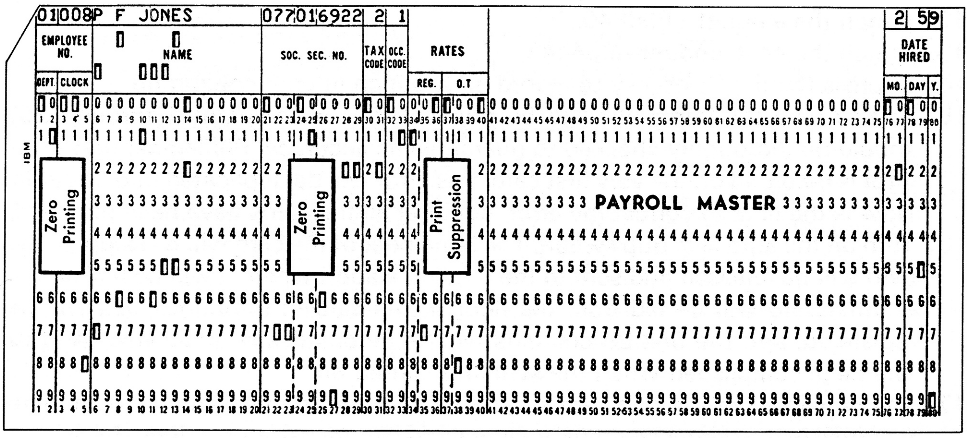


Fig. 5–19 Left-zero printing and print suppression.

Alternate Program

An alternate program unit can be installed in the 24 and 26 keypunch machines as an optional feature so that two program setups can be punched in one program card. Coding for an alternate program consists of 4 to 9 codes used in the same manner as the 12 to 3 codes for a normal program. Alternate programming is especially useful when two different types of cards are to be punched from the same source document in one keypunching operation. This permits punching of both types of cards without changing program cards. The program card is set up with normal programming for punching one type of card and alternate programming for the other. Both normal and alternate program codes are summarized here:

Normal Code	Alternate Code	Function
12	4	Field definition
11	5	Automatic skip
0	6	Automatic duplication
1	7	Alphabetic shift
2	8	Left-zero print
3	9	Print suppression
Space	Space	Numeric shift

Auxiliary Duplication—An Optional Feature

Auxiliary duplication is a feature in which duplication comes from a master card contained on another program drum rather than from the card at the reading station. The information to be duplicated is punched into a master card that is fastened onto an auxiliary program drum. The drum is located on a spindle in back of the program drum. The auxiliary duplication key manually controls auxiliary duplication. Depressing this key begins auxiliary duplication, which continues to the end of the field as defined by the 12 punches in the auxiliary program card. The data in the master card must be contained in the same card columns defined for duplication as the program card. The advantage of auxiliary duplication is that in some jobs certain common data are to be duplicated in certain cards but not in all the cards.

Additional Programming Features—29 Keypunch Only

The 29 keypunch has unlimited use of two program levels. Each row of punches in the program card controls a specific function when using program two.

Field Definition. 4 punch. A 4 punch is placed in every column of a field except for the first column. The 4 punch serves to continue any skip or duplication started in the first card column of the field to the end of that field. See Fig. 5–20.

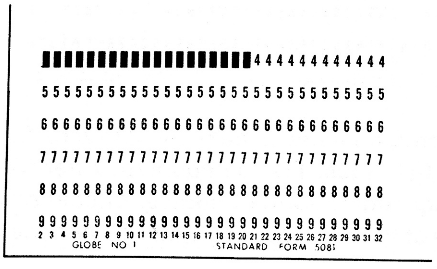


Fig. 5–20 Field definition.

Automatic Skip. 5 punch. A 5 punch is placed in the high-order position of any field that is to be skipped automatically by means of program control. See Fig. 5–21.

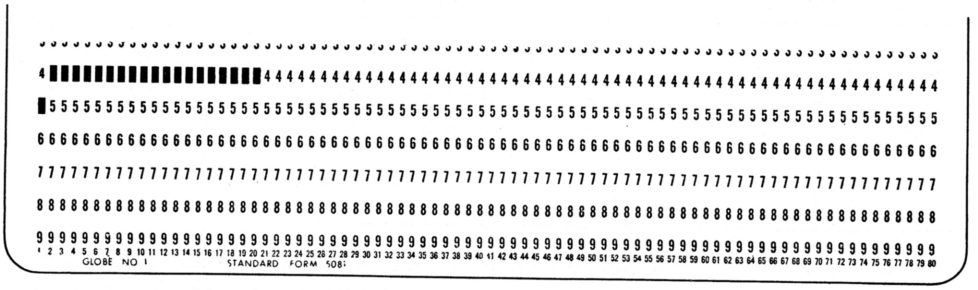


Fig. 5–21 Automatic skip.

Automatic Duplication. 6 punch. A 6 punch is placed in the high-order position of any field that is to be duplicated automatically. See Fig. 5–22.

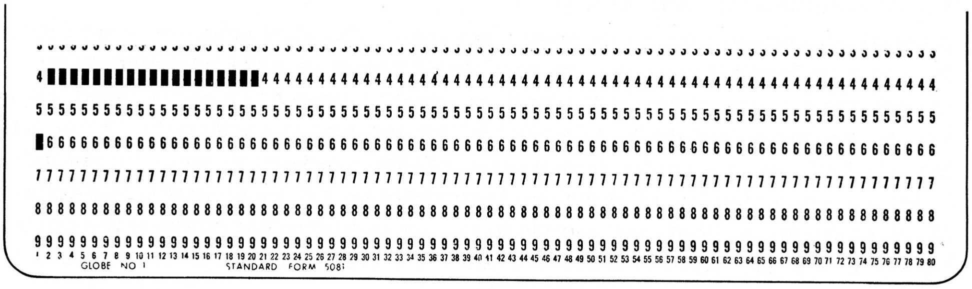


Fig. 5–22 Automatic duplication.

Alphabetic Shift. 7 punch. A 7 punch is placed in every card column of any field that is to contain alphabetic information. See Fig. 5–23.

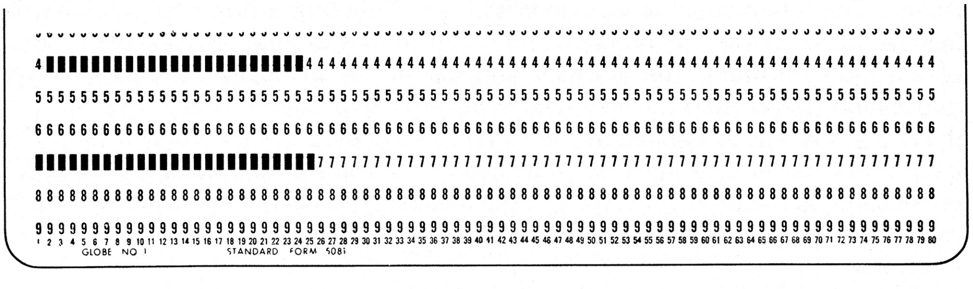


Fig. 5–23 Alphabetic shift.

Numeric Shift. Space. A space in the first column of the field causes the keypunch to be placed in a numeric mode. See Fig. 5–24.

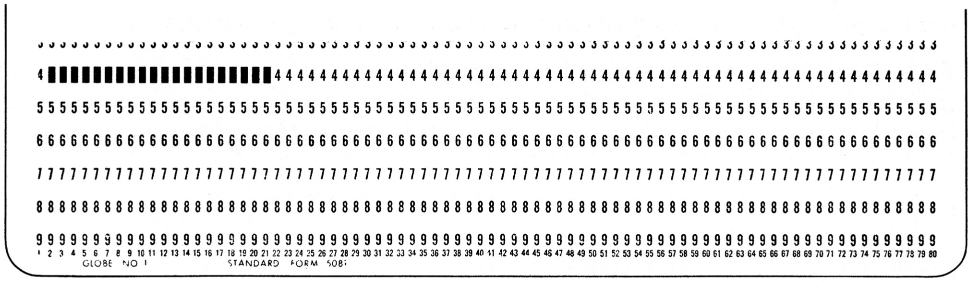


Fig. 5–24 Numeric shift.

Left-Zero Insertion. Model B only. In programming a field for left-zero insertion, the number of card columns in that field must first be counted. After the exact number has been determined, the correct coding for that number of columns is chosen from the following table and the rest of the field requires either 12 punches for program one or 4 punches for program two.

Number of Columns in Field	Program One	Program Two
3	1, 2, 3	7, 8, 9
4	1, 3	7, 9
5	1, 2	7, 8
6	2, 3	8, 9
7	3	9
8	2	8

If there is more than one field on a card to be programmed for left-zero insertion, each field must be programmed separately with the correct coding for its size followed by 12 or 4 punches as necessary.

11–12 Elimination—Model C Only

When programming for an interpreting operation, the elimination of overpunches from amount field columns must be considered. These are 11 or 12 punches used to identify the amount in that particular field as either a debit or a credit. When interpreting, it is more desirable to print the "5," for instance, rather than the "E" or "N" that would result if the control punch were not eliminated in the interpreting process.

Program one requires a 0 punch and program two a 6 punch in the card column of the program card that corresponds to the card column that contains the control punch on the data card. This will prevent the printing of an alphabetic character when it is only the digit punch that is desired.

The following table summarizes program card coding for the 29 keypunch.

Function	Program One	Program Two	Punched in	Model
Field definition	12	4	Every column except the first	A, B, C
Start auto skip	11	5	First column of field only	A, B, C
Start auto duplicate	0	6	First column of field only	A, B, C only when in punch mode
11-12 elimination	0	6	Necessary column only	C only when in interpret mode
Alphabetic shift	1	7	Each column of field	A, B, C only when in punch mode
Left zero—8 column field	2	8	First column of field only	B
Left zero—7 column field	3	9	First column of field only	B
Left zero—6 column field	2, 3	8, 9	First column of field only	B
Left zero—5 column field	1, 2	7, 8	First column of field only	B
Left zero—4 column field	1, 3	7, 9	First column of field only	B
Left zero—3 column field	1, 2, 3	7, 8, 9	First column of field only	B

LABORATORY ASSIGNMENTS

1. Prepare the program card illustrated in Fig. 5–17 by following the instructions provided in the text.
2. Punch the first three cards found on the source document in Fig. 5–15, utilizing the program card prepared in assignment 1 (olives, dates, figs). If any errors are made in the punching process, be sure to correct them in the proper manner using the DUP key.

REVIEW QUESTIONS

1. What does the program unit control?
2. What are the four components of the program unit and the function of each?
3. What is the simplest type of program card?
4. What is the purpose of the 12 punch on a program card?
5. What is the purpose of an 11 punch on a program card?
6. What is the purpose of a 0 punch on a program card?
7. What is the program card punching for alphabetic information?
8. What is the program card punching for a numeric field?
9. What is the procedure for correcting an error that has been punched on a card while using program control?
10. What is the program card punching for the printing of left zeros?
11. What is the program card punching for print suppression?
12. What is the coding and function for each operation when using alternate programming?
13. What is auxiliary duplication?

The following questions should be answered if using a 29 keypunch:

14. How are errors corrected in a field programmed for left-zero insertion?
15. What is the program card coding and function for each operation when using program two?
16. What is the left-zero insertion program card coding for both program one and program two?

QUESTION CARDS

Figures 5–25 through 5–28 contain questions that are to be interpreted. Write the question and the answer to the question on a separate sheet of paper.

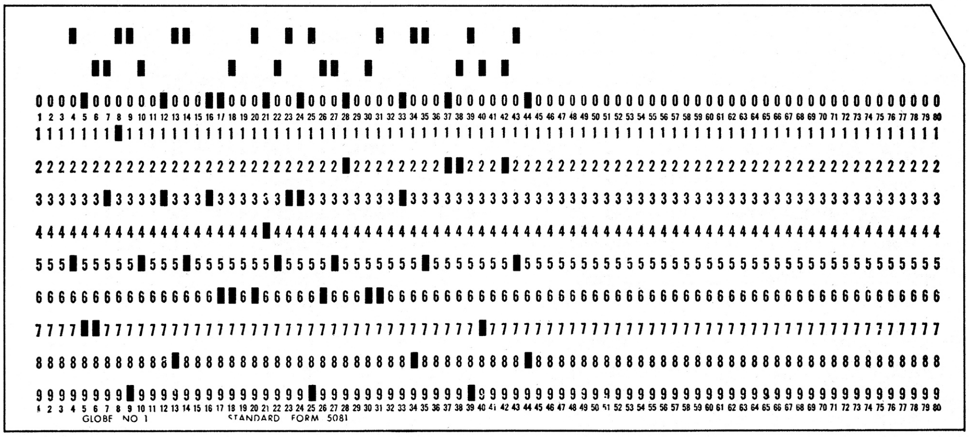

GLOBE NO 1
STANDARD FORM 5081

Fig. 5–25

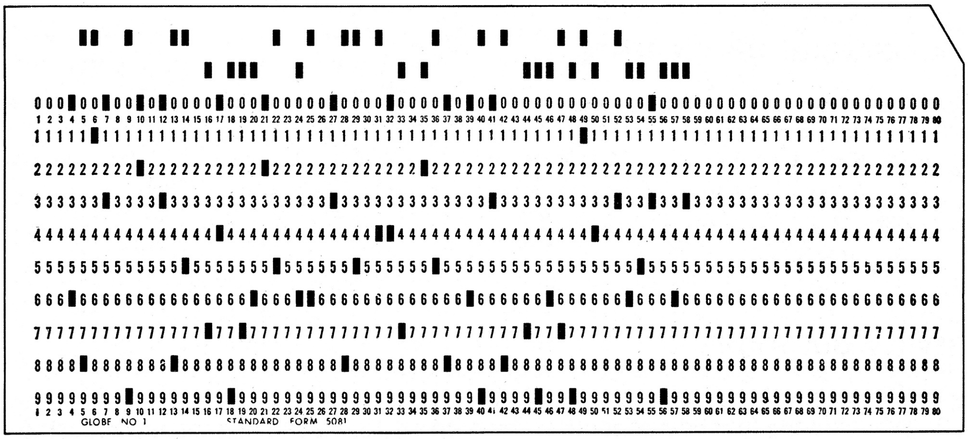

GLOBE NO 1
STANDARD FORM 5081

Fig. 5–26

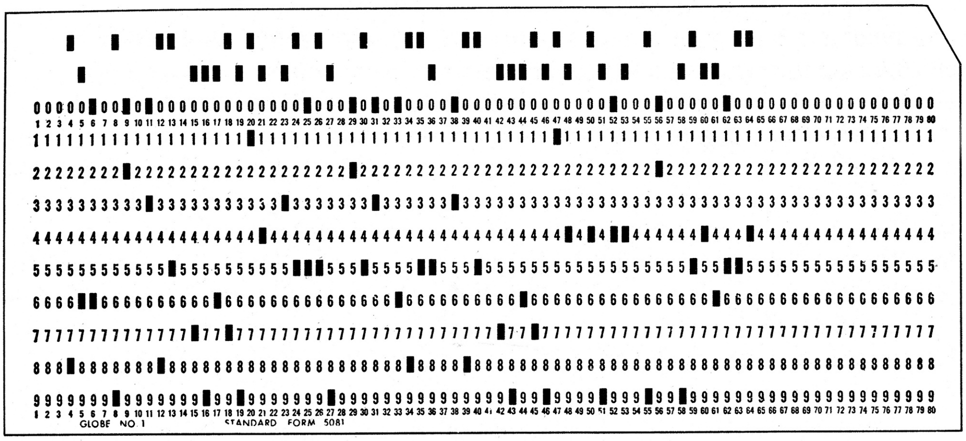

GLOBE NO 1
STANDARD FORM 5081

Fig. 5–27

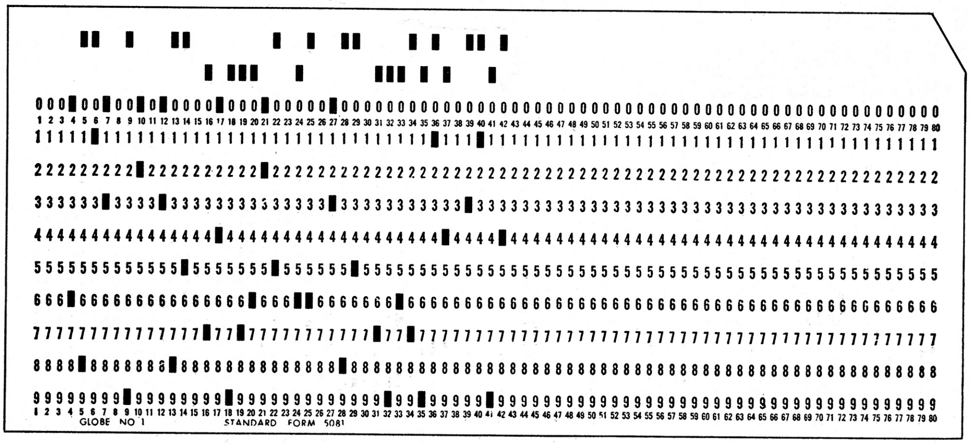

GLOBE NO 1
STANDARD FORM 5081

Fig. 5–28

chapter 6 TYPICAL KEYPUNCH PROCEDURES

READING THE JOB INSTRUCTION SHEET

It is extremely important that keypunch operators fully understand what is to be accomplished during a particular keypunching operation, and therefore keypunch operators should be given complete, clear, and understandable instructions, preferably written ones rather than oral ones. If given in a hurried manner, oral instructions will definitely affect the speed and accuracy of a particular assignment. The keypunch operator may not have fully understood the oral instructions, or may possibly have forgotten some of them and asked other operators, or may have punched the entire job incorrectly. These are a few of the reasons that instructions are generally written. One-time jobs or jobs that are keypunched infrequently are almost always written, because the keypunch operator will have little or no experience to use as a guide. In fact, all jobs should have written instructions that should become part of the keypunch operator's manual of procedure (a record of the various keypunch jobs for which she is responsible and the instructions for punching them).

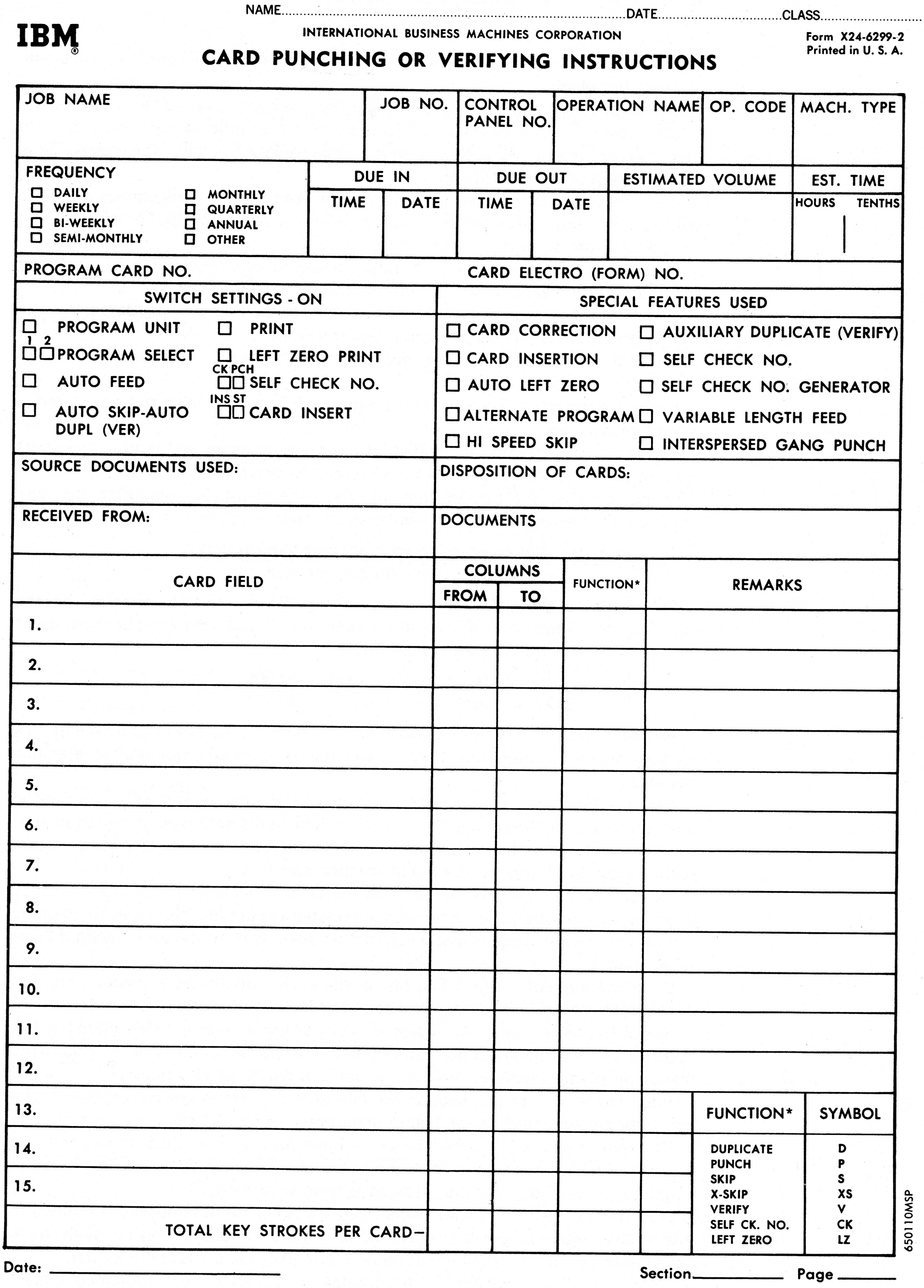
Usually there is a standardized form of some sort available on which the operator can record the necessary data on how to keypunch an assignment, or there is an assignment sheet on which she can find the necessary instructions. In either case the keypunch operator should know how to read and understand one of these instruction sheets.

Figure 6–1 is a standardized form, available from IBM, that is a good example of the type of instruction sheet the keypunch operator may be required to read. The IBM Card Punching or Verifying Instruction Sheet is divided into several sections into which information can be written quickly and easily. Each section on the instruction sheet is discussed here:

Job name. The title of the particular keypunching job is placed here. It could be "Payroll," "Accounts Receivable," or "Sales Analysis," for example.

Job no. In many data processing installations each particular assignment is given a number. If numbers are not given, it can be left blank.

Control panel no. This particular area is not designed to be utilized by keypunch machines because they do not require control panels. It should be pointed out, however, that the top two lines of the instruction sheet are standardized and are found on all instruction sheets for a complete variety of punched card data process-



NAME...DATE..............................CLASS.........................

IBM

INTERNATIONAL BUSINESS MACHINES CORPORATION

CARD PUNCHING OR VERIFYING INSTRUCTIONS

Form X24-6299-2
Printed in U. S. A.

JOB NAME	JOB NO.	CONTROL PANEL NO.	OPERATION NAME	OP. CODE	MACH. TYPE

FREQUENCY ☐ DAILY ☐ WEEKLY ☐ BI-WEEKLY ☐ SEMI-MONTHLY ☐ MONTHLY ☐ QUARTERLY ☐ ANNUAL ☐ OTHER	DUE IN		DUE OUT		ESTIMATED VOLUME	EST. TIME
	TIME	DATE	TIME	DATE		HOURS | TENTHS

PROGRAM CARD NO. CARD ELECTRO (FORM) NO.

SWITCH SETTINGS - ON	SPECIAL FEATURES USED
☐ PROGRAM UNIT 1 2 ☐☐ PROGRAM SELECT ☐ AUTO FEED ☐ AUTO SKIP-AUTO DUPL (VER) ☐ PRINT ☐ LEFT ZERO PRINT CK PCH ☐☐ SELF CHECK NO. INS ST ☐☐ CARD INSERT	☐ CARD CORRECTION ☐ CARD INSERTION ☐ AUTO LEFT ZERO ☐ ALTERNATE PROGRAM ☐ HI SPEED SKIP ☐ AUXILIARY DUPLICATE (VERIFY) ☐ SELF CHECK NO. ☐ SELF CHECK NO. GENERATOR ☐ VARIABLE LENGTH FEED ☐ INTERSPERSED GANG PUNCH
SOURCE DOCUMENTS USED:	DISPOSITION OF CARDS:
RECEIVED FROM:	DOCUMENTS

CARD FIELD	COLUMNS		FUNCTION*	REMARKS
	FROM	TO		
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				
TOTAL KEY STROKES PER CARD–				

FUNCTION*	SYMBOL
DUPLICATE	D
PUNCH	P
SKIP	S
X-SKIP	XS
VERIFY	V
SELF CK. NO.	CK
LEFT ZERO	LZ

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Fig. 6–1 Card punching instruction sheet.

ing machines. If any of these sections do not have meaning to a particular machine, they are left blank.

Operation name. Either "keypunching" or "verifying" would be written here.

Op. code. In many cases a number is given to the particular operation name. In this case the number 31 is the operation code for keypunching. The number 32 is the operation code for verifying.

Mach. type. The number of the machine used in this particular operation is written in this space. For the keypunch it would be 24, 26, or 29. For the verifier it would be either 56 or 59.

Frequency. The frequency of a particular keypunching assignment is recorded in this space by means of an "X" in the proper square.

Due in. This section is divided into two areas: the time and the date when the source document is available to the keypunch operator.

Due out. This section is also divided into two areas: the time and date the assignment is due.

Estimated volume. The approximate number of cards that are to be punched is placed in this area.

Est. time. This section is divided into two areas: hours and tenths. The exact amount of time is recorded here so the keypunch operator knows how much actual keypunching time she had to complete the assignment. In computing the time requirements for keypunching or verifying, the following formula is used:

$$\text{Hours} = \frac{\text{Number of cards} \times \text{Columns per card to be punched}}{\text{Number of keystrokes per hour}}$$

For example, if there are 500 cards containing 40 columns to be punched and the speed of the operator is 8,000 keystrokes per hour, the keypunching time would be 2.5 hours (6 minutes is a tenth of an hour).

$$\text{Hours} = \frac{500 \text{ cards} \times 40 \text{ columns per card}}{8{,}000 \text{ keystrokes per hour}} = \frac{20{,}000}{8{,}000} = 2\tfrac{1}{2} \text{ hours}$$

Program card no. If program cards for the various punching and verifying jobs are kept on file for future use, they are sometimes assigned a number for reference purposes.

Card electro (form) no. Each type of card is assigned a number. It is up to the operator to be sure the keypunching is being done in the right type of card by checking the number found on the card, usually found on the lower-left-hand corner, with the number found on the job instruction sheet.

Switch settings—on. An X placed in any of the squares tells the operator exactly how the switches are to be set for the keypunching operation. Note that some of the switch settings are optional and would not necessarily be found on a standard 26 or 29 keypunch.

Source documents used. The title of the source document is placed here. For example, the source document could be a sales invoice or a weekly time sheet.

Special features used. An X placed in any of the squares in this section lets the operator know if the keypunch job requires any special function or method. Note that some of these features are not standard on the 26 or 29 keypunch.

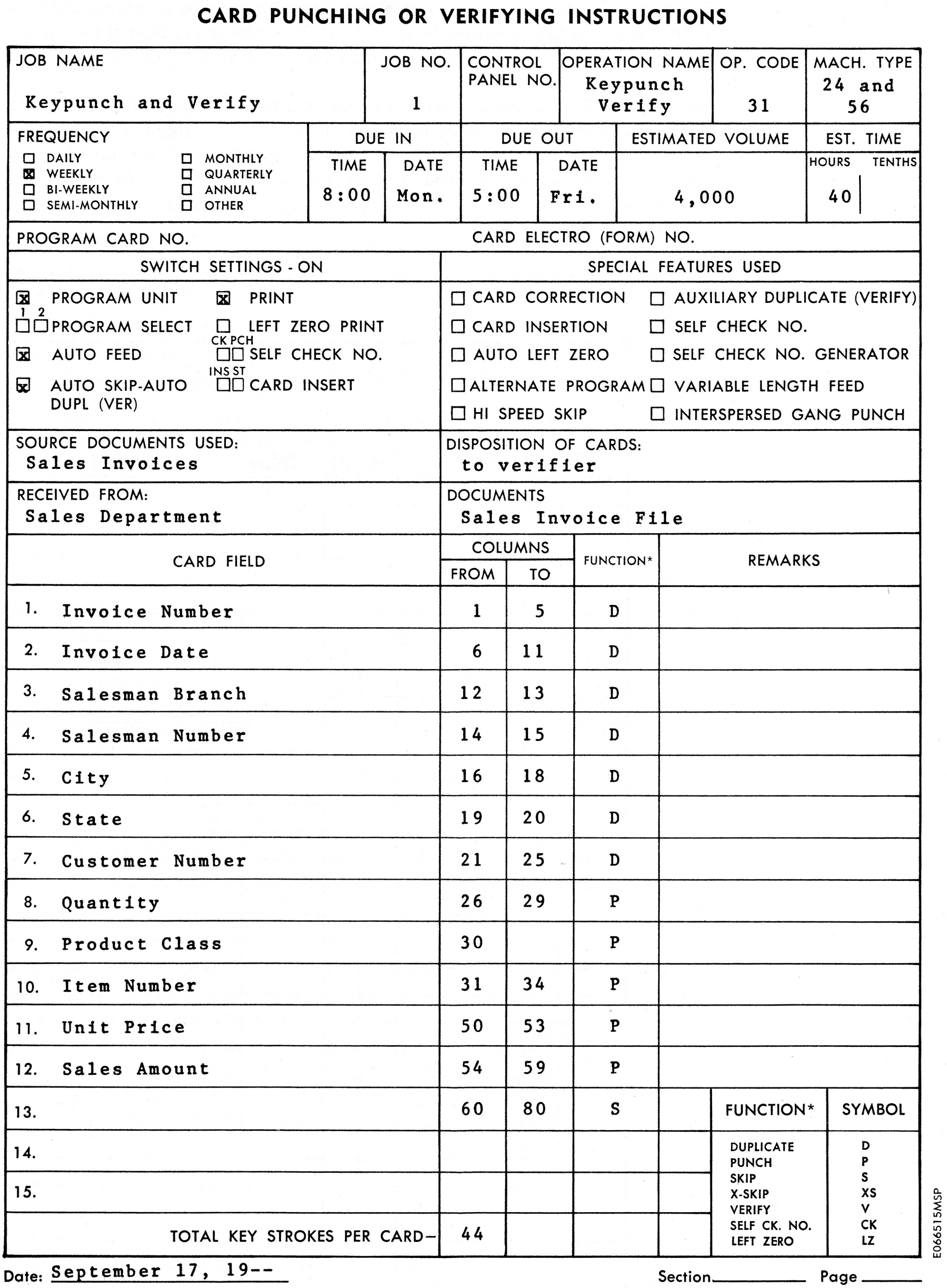
Received from. In this section the operator is given the exact location of the source document, such as the billing department of the timekeeper.

Disposition of cards. After the cards have been keypunched, the operator is given the location where the cards are to be taken. For example, the next location could be the verifier (after the cards have been keypunched).

Documents. After the cards have been keypunched, the operator is notified in this section where to put the source documents when she is finished with them. For example, the source documents could accompany the cards to the verifier.

Card field. The name of each of the fields on the card to be keypunched is listed in this area.

Columns: from, to. The exact card columns of the fields to be keypunched are



CARD PUNCHING OR VERIFYING INSTRUCTIONS

JOB NAME	JOB NO.	CONTROL PANEL NO.	OPERATION NAME	OP. CODE	MACH. TYPE
Keypunch and Verify	1		Keypunch Verify	31	24 and 56

FREQUENCY

☐ DAILY	☐ MONTHLY
☒ WEEKLY	☐ QUARTERLY
☐ BI-WEEKLY	☐ ANNUAL
☐ SEMI-MONTHLY	☐ OTHER

DUE IN		DUE OUT		ESTIMATED VOLUME	EST. TIME	
TIME	DATE	TIME	DATE		HOURS	TENTHS
8:00	Mon.	5:00	Fri.	4,000	40	

PROGRAM CARD NO.

CARD ELECTRO (FORM) NO.

SWITCH SETTINGS - ON		SPECIAL FEATURES USED	
☒ PROGRAM UNIT	☒ PRINT	☐ CARD CORRECTION	☐ AUXILIARY DUPLICATE (VERIFY)
1 2 ☐☐ PROGRAM SELECT	☐ LEFT ZERO PRINT	☐ CARD INSERTION	☐ SELF CHECK NO.
☒ AUTO FEED	CK PCH ☐☐ SELF CHECK NO.	☐ AUTO LEFT ZERO	☐ SELF CHECK NO. GENERATOR
☒ AUTO SKIP-AUTO DUPL (VER)	INS ST ☐☐ CARD INSERT	☐ ALTERNATE PROGRAM	☐ VARIABLE LENGTH FEED
		☐ HI SPEED SKIP	☐ INTERSPERSED GANG PUNCH

SOURCE DOCUMENTS USED: Sales Invoices	DISPOSITION OF CARDS: to verifier
RECEIVED FROM: Sales Department	DOCUMENTS Sales Invoice File

CARD FIELD	COLUMNS FROM	COLUMNS TO	FUNCTION*	REMARKS
1. Invoice Number	1	5	D	
2. Invoice Date	6	11	D	
3. Salesman Branch	12	13	D	
4. Salesman Number	14	15	D	
5. City	16	18	D	
6. State	19	20	D	
7. Customer Number	21	25	D	
8. Quantity	26	29	P	
9. Product Class	30		P	
10. Item Number	31	34	P	
11. Unit Price	50	53	P	
12. Sales Amount	54	59	P	
13.	60	80	S	
14.				
15.				
TOTAL KEY STROKES PER CARD–	44			

FUNCTION*	SYMBOL
DUPLICATE	D
PUNCH	P
SKIP	S
X-SKIP	XS
VERIFY	V
SELF CK. NO.	CK
LEFT ZERO	LZ

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Fig. 6–2 Example of a completed job instruction sheet.

placed here. For example, ITEM DESCRIPTION is to be punched in card columns 1 through 20.

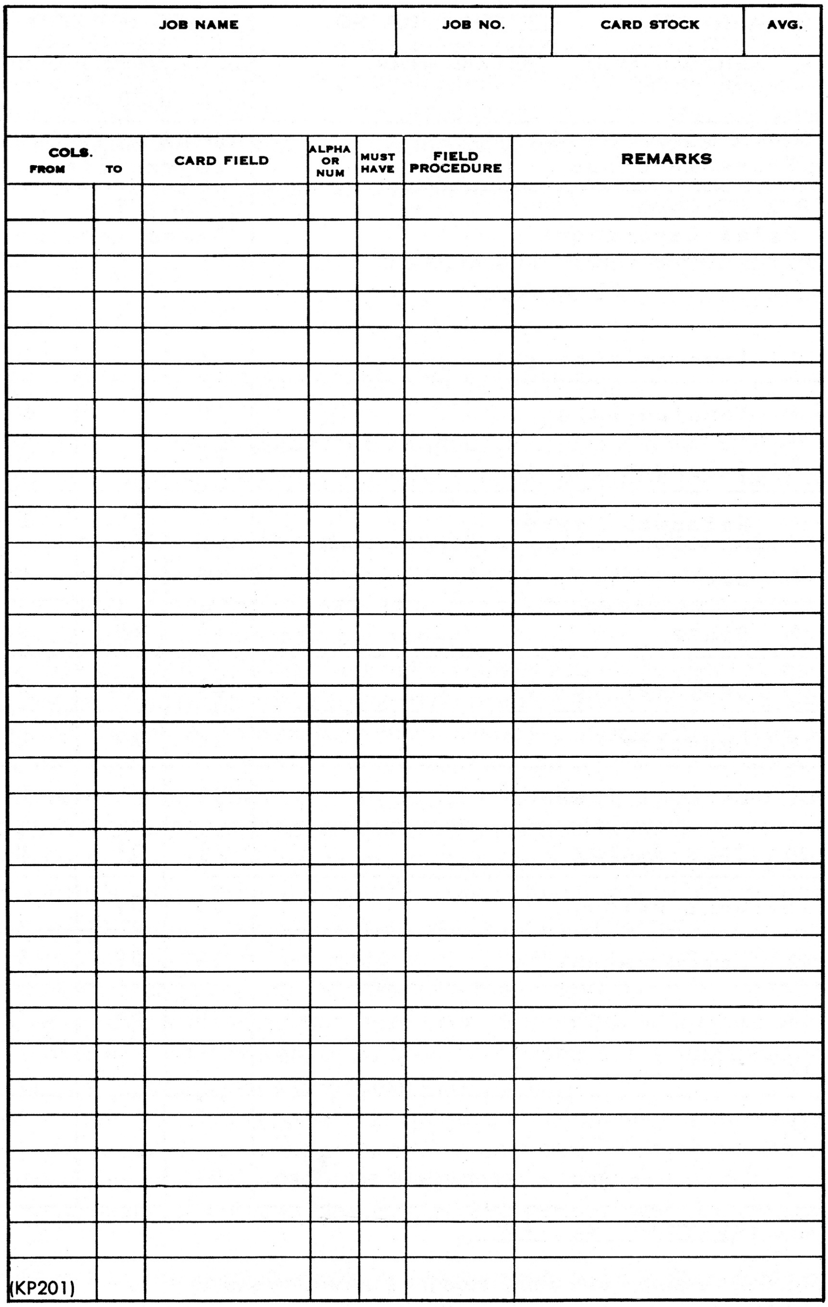
Function. The function is really an abbreviation for the type of program control that the operator is to use in punching the field. The asterisk is noted at the lower-right-hand corner of the page and tells the operator each symbol for the function to be performed.

Remarks. This is a special area that is reserved for instructions that cannot be placed in any other area. A remark placed in this section for a beginning keypunch operator might be "Manually turn the auto skip dup switch off for the first card punched for each invoice. Duplicate from the first card punched for each invoice."

Total keystrokes per card. The total number of card columns to be punched is placed in this section.

Figure 6–2 illustrates a completed job instruction sheet.

Sometimes job instruction sheets are not quite so detailed, as shown in Fig. 6–3.



JOB NAME	JOB NO.	CARD STOCK	AVG.

COLS.		CARD FIELD	ALPHA OR NUM	MUST HAVE	FIELD PROCEDURE	REMARKS
FROM	TO					
(KP201)						

Fig. 6–3 Example of a simplified job instruction sheet.

This kind of job instruction sheet merely serves to remind an experienced operator how to perform a particular keypunching operation.

LABORATORY ASSIGNMENT

1. Turn to the Appendix and do the punching assignment indicated by your instructor.

A SUMMARY OF PROCEDURES FOR COMMON KEYPUNCHING OPERATIONS

Engaging the Program Reading Mechanism

Turning the program control lever to lower the starwheels may not fully engage the reading mechanism; therefore, it is also necessary to press the release key. For this reason, after the program is turned on, leave it on, and, whenever possible, any temporary changes or interruptions in the punching routine should be handled by the functional switches and keys (on the 29 keypunch). A method that can be used if only one program level is punched in the program card is to press the program selection key for the program level not being used. Program control can again be restored by pressing the selection key for the program level being used.

Starting a Punching Operation

Press the feed key twice or depress it for two feed cycles, if a 29 keypunch, to register the card. If a prepunched master card is to be inserted, place it in the center of the card bed after the first feed cycle. On the second cycle the master card and the first blank card are registered at their respective stations.

When master information for automatic duplication is to be keyed in the first card of the group, turn off the auto skip dup switch before the first card is registered and leave it off until the master information is keyed. On this first card, use the skip key to skip the fields programmed for automatic skipping.

Stopping a Punching Operation

When an operation is to be stopped and the main-line switch is to be turned off before a batch of work is completed (as at a lunch hour), the card at the punch station should first be completely punched and released. Before the card is released, however, turn off the auto feed switch. This permits restarting the job without additional card handling.

When one batch of work is to be followed by another batch using the same master information and program control, a blank card should follow the last card of the batch through the punch station. The blank card can be released past the punch as the last card is released past the read station. This causes the blank card to automatically be punched with the master information for duplication into the first card of the next batch and thus eliminates the necessity for rekeying the master information. The auto feed switch should be off when the cards are released.

Clearing the Card Bed

When the card bed is to be completely cleared at the end of a punching operation without feeding more cards from the hopper, turn off the auto feed switch during the punching of the next-to-last card. The last card is registered for punching by pressing the register key. After the last card is punched and moved to the center of the card bed, it is moved to the stacker by operating the clear switch on the 29 keypunch. See Fig. 6–4.

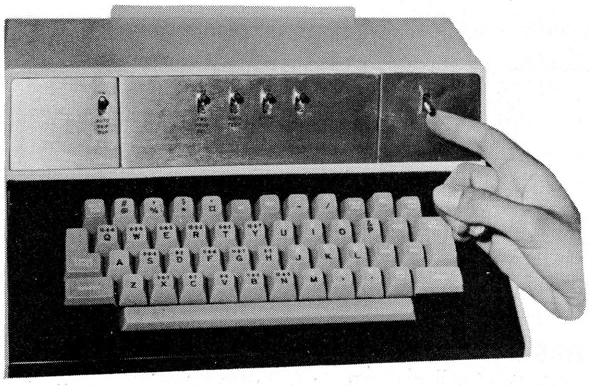


Fig. 6–4 Location of the clear switch.

If the auto feed switch is not turned off after the last card is punched, operating the clear switch causes two blank cards to be stacked behind the last punched card in the stacker.

On the 29 keypunch, the clear switch is used to completely clear the card bed. When operated, the switch causes all cards in transport between the feed hopper and the stacker unit to progress, with no further punching, to the stacker. No new cards are fed from the feed hopper during this operation. If the automatic feed switch is turned off after the last card to be punched is completed, the release and register keys must be depressed alternately three times. In this case two blank cards will be stacked behind the last punched card in the stacker.

On the 24 and 26 keypunches, after the last card is punched and moved to the center of the card bed, it is moved on to the stacker by depressing the register key, the release key, and then the register key again.

Removing a Card from the Center of the Card Bed

To remove a card from the center of the card bed without affecting the following cards, manually move it into the read station and press the release key. This moves the card to the left of the card bed, where it can be lifted out.

Removing a Card from the Left of the Card Bed

When a card has been released from the read station but not stacked, it is in the left side of the card bed. For easy manual removal, move the card to the extreme left by pressing down on the arm that extends from the read station.

Removing a Card from the Punch or Read Station

If for any reason a card must be removed manually from the punch or read station, hold down the pressure roll release lever while pulling out the card. If a card at the punch station does not move easily, press all the numeric keys; then, while holding down the lever, pull out the card without tearing it.

Spacing over Columns

Without program control, the duplicate key may be used to space over columns if the same columns are unpunched in the preceding card at the read station or if there is no card at the read station. This operation is faster than using the space bar.

Multiple Punched Columns

Punch two or more digits in one column by holding down the multiple punch key while pressing the digit keys one at a time. The keyboard is automatically shifted to numeric operation when the multiple punch key is pressed.

Corner Cuts

Cards can have a normal upper-left or upper-right corner cut. Cards with lower corner cuts cannot be fed. Round corner cut cards are acceptable.

Single Card Feeding

When the cards are to be fed manually one at a time, place them directly in the card bed, to the right for punching or in the center for reading. Do not insert single cards in the card hopper. When placing a card in the center of the card bed, position it so that the column 1 edge is between the feed rolls at the right of the read station. If the card is pushed in too far, improper feeding and duplicating may result.

Punching a Single Field on a Card Without Program Control

1. Turn on the main-line switch and then depress the REL key. When the keypunch is warmed up sufficiently for operation, the column indicator will make one complete revolution and lock into position at card column 1.
2. During the warm-up period, the functional switches should be turned off, the possible exception being the print switch. Also during the warm-up period, the program unit should be turned off by depressing the program control lever.
3. Place the card to be punched into the card bed to the right of the punching station. This is done by inserting the card beneath the metal strip at the top of the card bed and into the metal guides located at the bottom of the card bed. Care should be taken not to lift up on the card feed pressure finger at any time. Slide the card as far as possible toward the punching station until the card stops. Then pull the card about $\frac{1}{4}$ inch to the right. Keep the card flat on the card bed so that it will be registered properly. It is very important that the card not actually touch the punching dies when the card is registered, for it might be registered improperly and punching will not begin in card column 1 but in card column 2 or 3.
4. Depress the REG key.
5. While holding down the NUMERIC shift key, depress the proper keys to cause punching of numeric characters. Alphabetic characters can be punched without holding down the ALPHA shift key.
6. To remove the card from the 29 keypunch, turn on the clear switch. To remove the card from the 24 or 26 keypunch, press the REL key to release the card if card column 80 was not punched.
7. Press the REG key to register the card at the reading station.
8. Pres the REL key to release the card.
9. Press the REG key to place the card in the stacker.

Duplicating a Damaged Card

1. Turn on the main-line switch and press the REL key.
2. Turn off the functional switches and program control.
3. Place the card to be duplicated into the notches on the plastic guides at the reading station. Slide the card as far as possible toward the reading station until the card stops. Then pull the card to the right about $\frac{1}{4}$ inch. It is not necessary to put the right-hand portion of the card beneath the guides. The card may be damaged further if this is attempted.
4. Place the blank card into the guides at the punching station. Slide the card to the left until it stops and then pull it back about $\frac{1}{4}$ inch, making sure it is flat in the card bed.
5. Press the REG key. This will register both cards.
6. Press the DUP key until the entire card has been duplicated. If many card columns are unpunched on the right edge of the original card, it might be faster for the operator to press the REL key after the last column that contains punching has been punched.

7. On the 29 keypunch, turn on the clear switch to remove the cards. On the 24 and 26 keypunches, press the REG key to stack the nicked card and register the duplicated card at the reading station. Press the REL key and then the REG key to stack the duplicated card.
8. Sight check the cards to guarantee the accuracy of the duplicated card. Destroy the nicked card.

Procedure for Correcting Cards That Contain Errors in Punching

1. Turn on the main-line switch and then depress the REL key.
2. Turn off the functional switches and program control.
3. Place the card that contains the error into the notches on the plastic guides at the reading station. Slide the card as far as possible toward the reading station until the card stops. Then pull the card to the right about $\frac{1}{4}$ inch. It is not necessary to place the right-hand portion of the card beneath the guides.
4. Place a blank card into the guides at the punching station. Slide the card to the left until it stops and then pull it back about $\frac{1}{4}$ inch, making sure it is flat in the card bed.
5. Press the REG key. This will register both cards.
6. Press the DUP key until the card column containing the error is reached.
7. Depress the proper alphabetic or numeric key.
8. Depress the DUP key to finish duplicating the card.
9. On the 29 keypunch, turn on the clear switch to remove the card. On the 24 and 26 keypunches, depress the REL key to release the cards. Depress the REG key to stack the error card and register the correct card at the reading station. Press the REL key and then the REG key to stack the corrected card.
10. Sight check the duplicated card columns to guarantee their accuracy and then check the corrected columns to ensure that they were punched correctly. Be sure to destroy the original card that contains the error.

Punching All-Numeric Information with Program Control

1. Turn on the main-line switch and then depress the REL key.
2. Joggle the blank cards and place them in the hopper.
3. Turn on the auto feed and the print functional switches if printing is desired.
4. Raise the starwheels and remove the program drum.
5. Place a blank card on the program drum and return the drum and card to the program unit.
6. Lower the starwheels.
7. Feed two cards from the hopper.
8. Numeric characters may be punched. Alphabetic characters will require the ALPHA shift key to be depressed.
9. Release the card if column 80 was not punched.
10. Start punching the next card.

Punching with Program Control

1. Put the program card on the drum, place the cards in the hopper, turn on the main-line switch, lower the starwheels, and press the REL key.
2. Turn on the auto feed switch. Turn off the auto skip dup switch. The auto skip dup switch must be off because there is nothing to duplicate at the reading station. Only after the first card has been punched and registered at the reading station should the auto skip dup switch be turned on. If the switch were on and no card were at the reading station, the keyboard would lock.
3. Use the feed key and feed two cards from the hopper.
4. At this time punching can begin. It will not be necessary to hold down the numeric or alphabetic shift keys unless a numeric character is to be punched into

an alphabetic field or vice versa. Information to be duplicated is also punched at this time on the first card. When card column 80 has been reached or as soon as possible, the information to be duplicated should be thoroughly checked to guarantee its accuracy. Remember that if an error is recorded on the very first card, this error will be duplicated into all cards.

5. When the card has been completed, turn on the auto skip dup switch.
6. From this point on punching can proceed until all cards have been punched. See the operating suggestion on clearing the card bed (p. 71).

Suspending Automatic Duplication on the First Card

Master information in the first card of each new group must be keyed. Automatic duplication must be suspended for that card by turning off the auto skip dup switch. Because this requires the manual setting of the auto skip dup switch each time master information changes, consideration should be given to proper card design as an aid to the most efficient operation.

Several recommended procedures for punching the first card of each group are as follows (the procedures vary depending on the conditions brought about by differences in card design). Whenever possible, program the first field in a card for manual operation. This gives the operator a chance to turn the auto skip dup switch off before starting to punch the first card of a new group.

1. When the first card of a new group is registered at column 1, turn the auto skip dup switch off.
2. Punch the complete card.
3. When the second card of the group is registered at column 1, turn the auto skip dup switch on. (The switch could have been turned on after the master information was punched.)

Automatic duplication should not immediately follow an automatic skip.

1. Punch the first field.
2. Automatically skip the second field (auto skip dup switch on).
3. Turn off the auto skip dup switch; punch the third field.
4. Punch the fourth field; turn on the auto skip dup switch.

Sometimes other factors in the use of the cards make it necessary for automatic duplication to follow an automatic skip. In such cases, study the two possible procedures and follow the best one.

1. Long-Skip Field
    (a) Punch the first field.
    (b) Automatically skip the second field. During the skip, turn off the auto skip dup switch to prevent automatic duplication in the following field. (This can be done if the skip is fairly long.)
    (c) Punch the third field and turn on the auto skip dup switch.
2. Short-Skip Field
    (a) Turn off the auto skip dup switch when the card is registered at column 1.
    (b) Punch the first field.
    (c) Skip the second field by pressing the skip key.
    (d) Punch the third field and turn on the auto skip dup switch.

When automatic duplication is immediately followed by an automatic skip, punch the first card as follows:

1. Turn off the auto skip dup switch when the card is registered at column 1.
2. Punch the first field.
3. Punch the second field. (Either during or at the end of this field, turn on the auto skip dup switch so that the following field can be automatically skipped.)
4. Automatically skip the third field.

If an automatic skip must come first in a card immediately followed by automatic duplication, the procedure for handling the punching is as follows:

1. Long-Skip Field
    - (a) Automatically skip the first field. During the skip, turn off the auto skip dup switch to prevent automatic duplication in the second field. (This can be done if the skip is fairly long.)
    - (b) Punch the second field and turn on the auto skip dup switch.
    - (c) Punch the third field.
2. Short-Skip Field
    - (a) Turn off the auto skip dup switch before the last card of a group is punched in column 80.
    - (b) Press the skip key to skip the first field of the first card in the following group.
    - (c) Punch the second field and turn on the auto skip dup switch.
    - (d) Punch the third field.

When an automatic skip field comes between two fields programmed for automatic duplication, punch the first card as follows:

1. Turn off the auto skip dup switch when the card is registered in the column.
2. Punch the first and second fields.
3. Skip the third field by pressing the skip key.
4. Punch the fourth field and turn on the auto skip dup switch.

Left-Zero Printing on the 29 Keypunch

1. Zeros as well as dashes and ampersands to the left of the first significant digit in a field are automatically suppressed (not printed) when the print switch is on. To print the preceding or left zeros, turn on the zero print switch.
2. If several successive fields are to be programmed for automatic duplication and the preceding zeros are not to print in each field, it is necessary to program each field independently for automatic duplication rather than as one large field.

It should be noted that a zero always prints in the units position of a field that does not have a significant digit. In other words, if the field is to contain all zeros, the last zero will print.

Print Suppression on the 29 Keypunch

Print suppression (causing a printing keypunch not to print) by means of program control is not available for the 29 keypunch. If print suppression is desired for a particular field on a card, the print switch must be turned off.

Procedure for Left-Zero Insertion—Model B Only

1. The program card must be coded for left-zero insertion.
2. Only the significant digits are keyed in the field. The digits do not punch at this time, however, but are entered into a storage device. Significant digits are all digits except preceding zeros. A zero is significant only if it appears after a digit 1 through 9 punch. *Example:* 230, the zero is significant and should be punched; 023, the zero should not be punched. If an error is sensed by the operator during the keying process, the error reset key may be depressed to erase the contents of storage. The entire field must again be rekeyed.
3. After all significant digits have been keyed, press the left-zero key. The keypunch will automatically punch the numbers that were keyed into storage and also punch the proper number of preceding zeros that are required. A slight pause in keying is necessary to permit the machine to complete the punching of the left-zero field. Approximately $\frac{1}{2}$ second is needed to punch an 8-column field, with less time taken for smaller fields.

It should be noted that some of the special character keys located on the left side of the numeric section of the keyboard can cause the machine to unload the contents of storage and improperly punch the left-zero field. Care should be taken that these adjacent keys are not pressed accidentally because the error reset key cannot correct this kind of error and a new card must be punched.

Interpreting on the Model C—All 80 Columns on a Card

1. Set the punch-interpret switch to interpret. If all 80 columns are to be interpreted in each card, a program card is not necesssry. Program control need not be on.
2. Turn on the auto feed switch.
3. Place the cards to be interpreted in the hopper. If there is only one card, it may be fed manually.

Interpreting on the Model C—Less Than 80 Columns on a Card

1. Set the punch-interpret switch to interpret.
2. Turn on the auto feed switch.
3. Turn on program control.
4. Turn on the auto skip dup switch.
5. Place the program card on the program drum. Programming for this operation requires that any columns or fields not to be interpreted be skipped. Skipping is programmed the same way as on the Model A.

Punching and Skipping—24 and 26 Keypunches Only

The punching of an X in a numeric field normally causes skipping, but in an alphabetic field it does not. If a control X (such as a credit X or a date X) is to be punched in a numeric field but skipping must not occur, the following should be considered:

1. If the X is punched (keyed or duplicated) *alone* in a column, skipping to the beginning of the next field will occur. This skipping can be prevented by coding the single column of the field with a 1 in the program card (on an alphabetic machine) or by eliminating the program 12 code in the column following the X punching. In the first method, if a figure instead of the X is ever keyed, the numeric shift key must be held down. In the second method, the program card must be punched with a 0 in the following column if automatic duplication is performed; or the duplicate key must be depressed a second time, or held over the blank column, if manual duplication is performed.
2. If a control X is to be *keyed over* a digit, the multiple punch key must be depressed in order to key the two digits in one column. (On machines not equipped with the multiple punch key, the space bar is used.) This depression will prevent the X skipping and no provision need be made in the program card.
3. If the control X and a digit are duplicated, skipping to the end of the field will occur. This can be prevented by coding the column with a 1 in the program card (on an alphabetic machine) or by eliminating the program 12 code in the following column. In the first method, if the column is keyed at any time, the multiple punch key (or space bar) must be depressed. This will shift the keyboard into numeric position and prevent skipping. In the second method, the program card must be punched with a 0 in the following column if automatic duplication is being performed; or the duplicate key must be depressed a second time, or held over the blank column, if manual duplication is being performed.

Keyboard Locking—29 Keypunch

The keyboard locks under any of the following conditions:

1. The main-line switch is turned off and then on while a card is registered at the

punch station. The clear switch should be operated to move the card to the stacker; however, the card at the punch station need not be removed. One depression of the feed key brings a second card down without advancing the first card and restores the machine to operating condition.

2. On the combination keyboard, when either the A or the Z key is pressed in a column programmed for numeric punching. Press the error reset key to unlock the keyboard.
3. A blank column is duplicated in a field programmed for numeric punching. This serves as a blank-column detection device to ensure that a digit is punched in every column of a numeric field that is being duplicated. Unlock the keyboard by pressing the error reset key on the alphabetic shift key on the combination keyboard.
4. A card is not registered at the punch station. It is impossible to do any punching or spacing unless a card is registered at the punch station. To move a card into punching position, press the register, the feed, or (with automatic feed switch on) the release key.
5. The register key or the feed key is pressed when a card is already registered at the punch station. Press the error reset key to unlock the keyboard.

Keyboard Locking—24 and 26 Keypunches

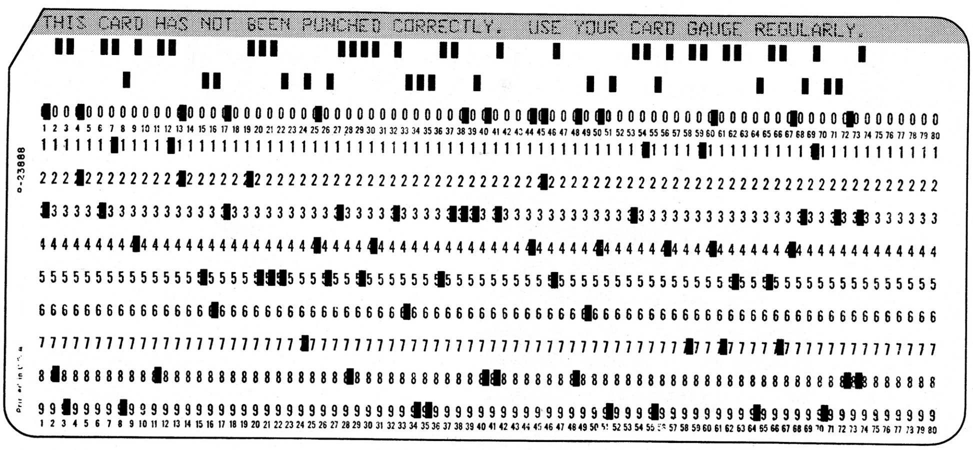
The keyboard is locked under any of the following conditions:

1. The main-line switch is turned off and then on while a card is registered at the punching station. The keyboard may be unlocked by depressing the release key.
2. On the combination keyboard, an alphabetic key is depressed in a field programmed for numeric punching. The keyboard can be unlocked by depressing the backspace key (the operator then spaces to the next columns), the release key (the card is released without punching), or the alphabetic shift key (the letter is punched).
3. A blank column is duplicated in a field programmed for numeric punching. This serves as a blank-column detection device to ensure that a digit is punched in every column of a numeric field that is being duplicated. The keyboard can be unlocked by depressing the backspace key or the alphabetic shift key on the combination keyboard.
4. A card is not registered at the punching station. This feature makes it impossible to do any punching or spacing unless a card is in position to be punched. The register, feed, or release (with the automatic feed switch on) key can be depressed to move a card into punching position.
5. The register key or the feed key is depressed when a card is registered at the punching station. The keyboard can be unlocked by depressing the release key.

Use of the Card Gauge

Figure 6–5 illustrates a card that has been off-punched. A card that has been improperly punched by the keypunch machine is sometimes quite easy to detect, but often the alignment of the hole in the card column is just a fraction of a card column off, causing incorrect card reading in other punched card data processing machines. It is for this reason that a card gauge (Fig. 6–6) is used at least once a day to check the punching alignment of the keypunch.

An off-punched card can easily be found by the card gauge. Sometimes a card that has been improperly registered will be off-punched; therefore at least three or four cards should be checked with the gauge to determine if the keypunch is actually in need of readjustment. See Fig. 6–7.



THIS CARD HAS NOT BEEN PUNCHED CORRECTLY. USE YOUR CARD GAUGE REGULARLY.

Fig. 6–5 Off-punched card.

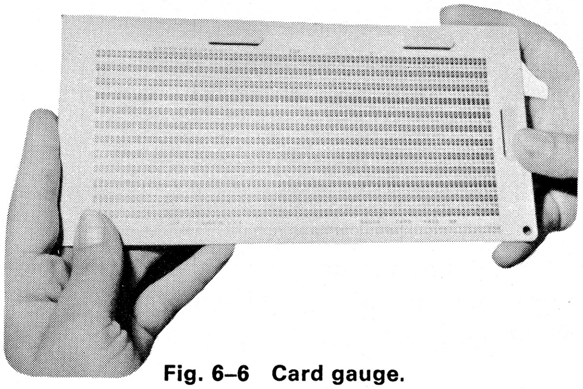


Fig. 6–6 Card gauge.

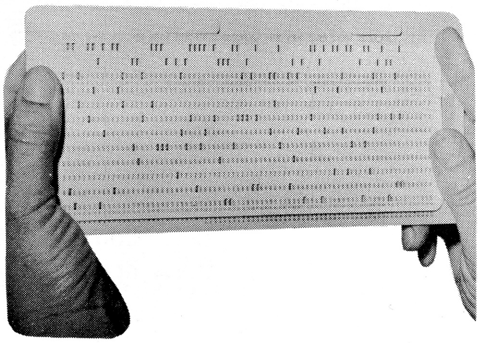


Fig. 6–7 An off-punched card being checked on the card punch.

RIBBON REPLACEMENT

The ribbon on the printing keypunch is fed between two spools through ribbon guides and under the punch die. See Fig. 6–8. The old ribbon is removed and a new one is inserted as follows:

1. Turn off the main-line switch.
2. Remove the ribbon spool retaining clamp (Fig. 6–9).

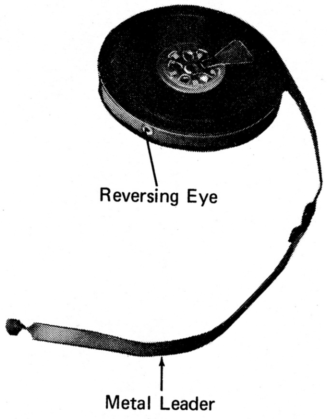


Fig. 6–8 Keypunch ribbon.

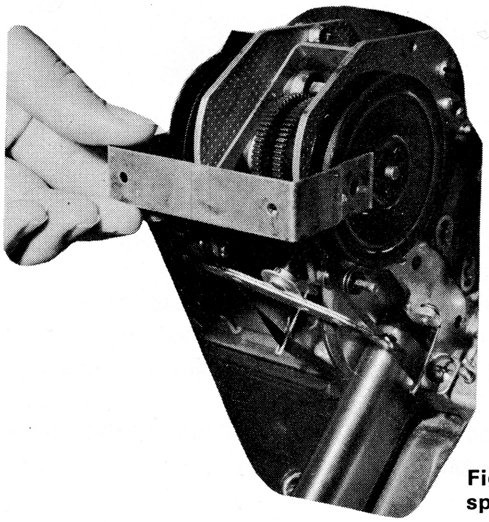


Fig. 6–9 Removal of spool retainer.

3. Cut or break the old ribbon.
4. Remove both spools from the spindles and pull out the two pieces of ribbon. Empty one of the spools. See Fig. 6–10.

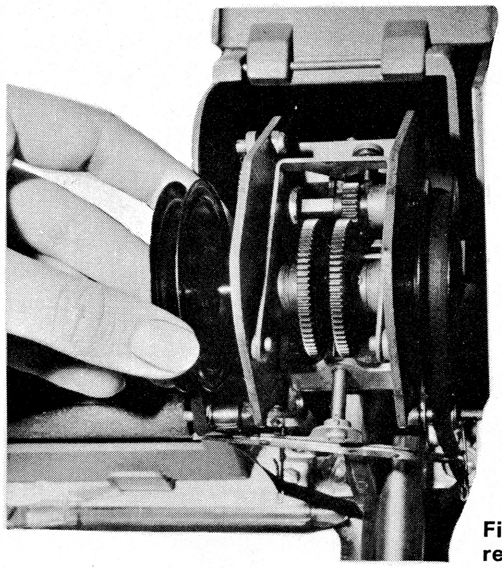


Fig. 6–10 Ribbon change removing spool.

5. Place the spool of new ribbon on the right-hand spindle, positioning it so that the ribbon is fed from the top of the spool toward the front of the machine. Lift the right end of the ribbon reversing arm (Fig. 6–11), if it is not already up, and unroll $1\frac{1}{2}$ feet of ribbon; then push down the right end of the ribbon reversing arm to hold the spool steady.

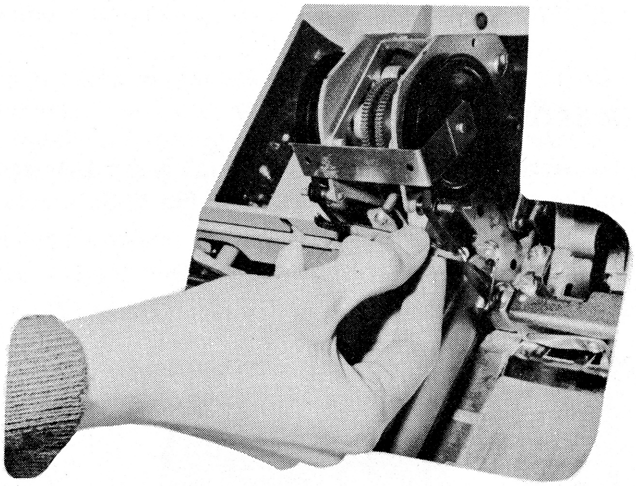


Fig. 6–11 Ribbon reversing arm.

6. Feed the metal leading end of the ribbon between the punch die and the card bed, sliding it through the groove in the center of the card bed (between the 3 and 4 punching positions). The groove permits the extra thickness of the metal end and the reversing eyelet to pass between the punch die and the card bed. Be sure to keep the ribbon straight, with the top side up at all times. See Fig. 6–12.
7. Hook the metal leading end of the ribbon in the slot in the center of the empty spool and wind the ribbon onto the spool until the reversing eyelet is on the spool. See Fig. 6–13.

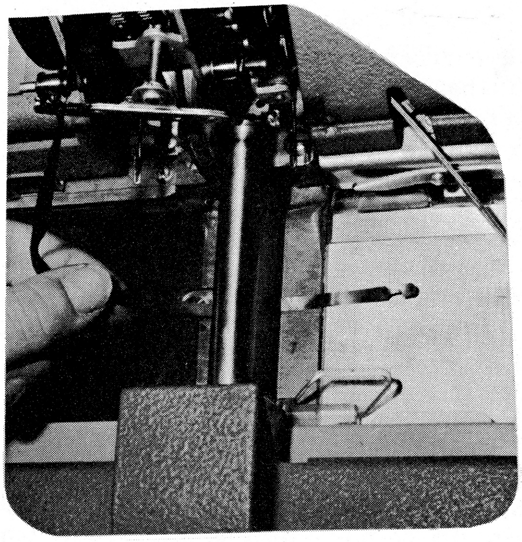


Fig. 6–12 Threading groove.

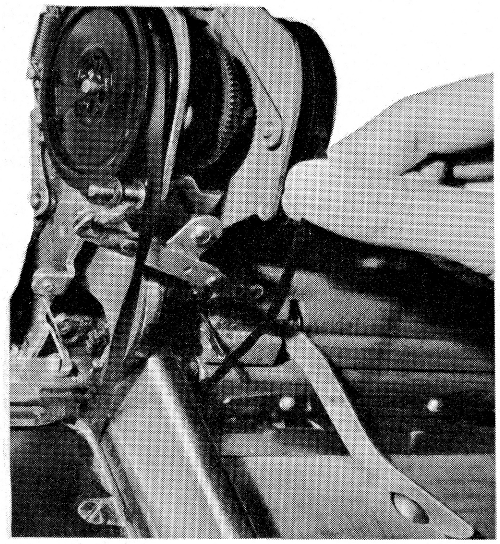


Fig. 6–13 Hooking the ribbon.

8. Place the spool on the left spindle, positioning it so that the ribbon is fed onto the spool over the top. Be sure that the ribbon is not twisted and that the top side of the ribbon is still up. See Fig. 6–14.
9. Hook the ribbon around the right and left wire ribbon guides and slide it through the right and left ends of the reversing arm and over the rollers in front of the ribbon spools.
10. Slide the ribbon up under the punch die so that it is in the upper groove provided for it, in card-printing position (above the 12 punching position), and take up the slack.
11. Replace the ribbon spool retaining clamp.

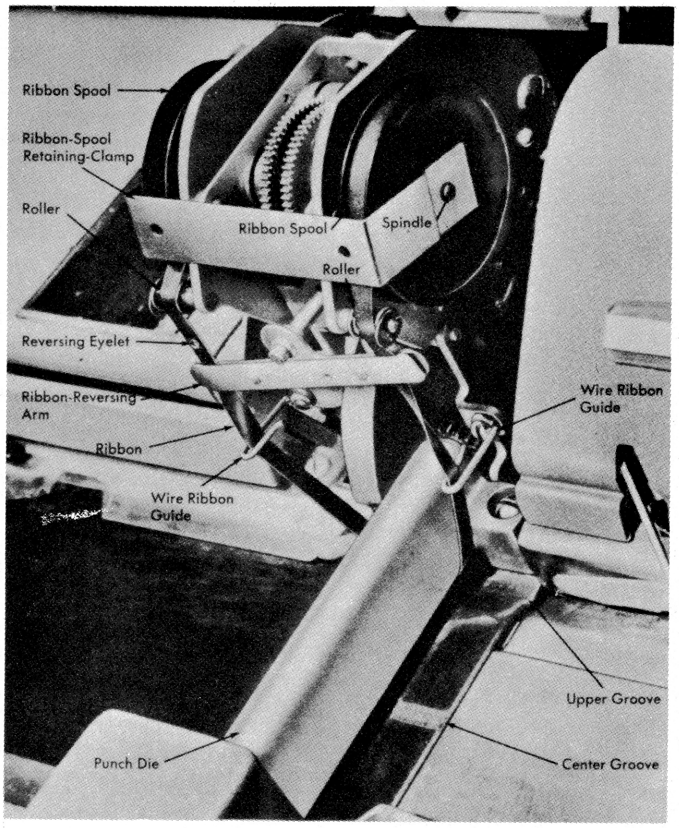

Ribbon Spool
Ribbon-Spool Retaining-Clamp
Roller
Ribbon Spool
Spindle
Roller
Reversing Eyelet
Ribbon-Reversing Arm
Ribbon
Wire Ribbon Guide
Wire Ribbon Guide
Upper Groove
Punch Die
Center Groove

Fig. 6–14 Ribbon correctly positioned.

LABORATORY ASSIGNMENTS

1. When punching future assignments as required, practice some of the suggestions presented in this section of the text. They will help to make your job easier as well as quicken your speed of operation. Be sure that you can perform the following in the correct manner:

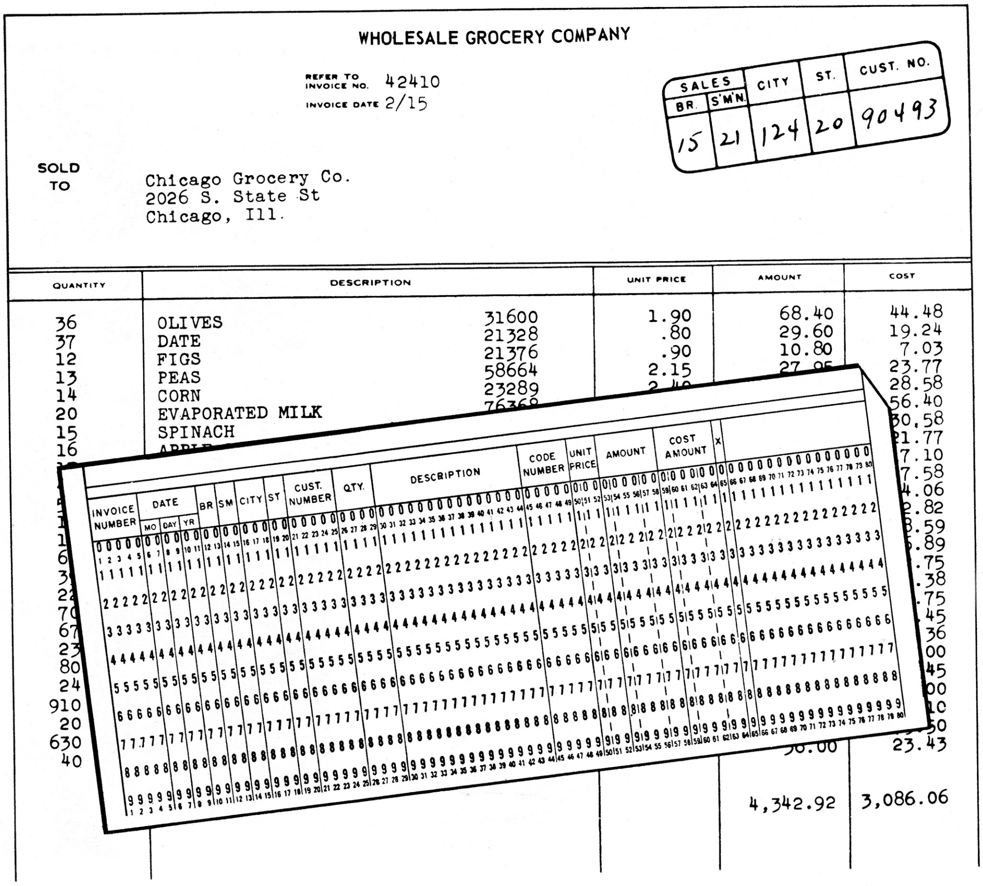
   Engaging the program reading mechanism
   Starting and stopping a punching operation
   Clearing the card bed
   Removing cards from the card beds and the reading and punching stations
   Spacing over unpunched columns
   Punching multiple punched columns
   Suspension of automatic duplication of the first card of a group
   Unlocking the keyboard

2. If a card gauge is available, examine it and use it.
3. Examine the printing unit of the keypunch. Although you may not be asked to actually replace a ribbon, go through the steps and become familiar with the parts.
4. Turn to the Appendix and do the punching assignments indicated by your instructor.

REVIEW QUESTIONS

From the source document and card shown in Fig. 6–15, answer the following questions.

1. What is the job name?



WHOLESALE GROCERY COMPANY

REFER TO INVOICE NO. 42410
INVOICE DATE 2/15

SALES BR.	SALES S'M'N.	CITY	ST.	CUST. NO.
15	21	124	20	90493

SOLD TO
Chicago Grocery Co.
2026 S. State St
Chicago, Ill.

QUANTITY	DESCRIPTION		UNIT PRICE	AMOUNT	COST
36	OLIVES	31600	1.90	68.40	44.48
37	DATE	21328	.80	29.60	19.24
12	FIGS	21376	.90	10.80	7.03
13	PEAS	58664	2.15		23.77
14	CORN	23289			28.58
20	EVAPORATED MILK				56.40
15	SPINACH				
16					
					23.43
				4,342.92	3,086.06

Fig. 6–15 Source document and related card.

2. What is the operation code?
3. What is the machine type?
4. How frequently would this job have to be keypunched?
5. How would the switch settings be set for either the 29 or 26 keypunch?
6. List the titles or names of each field to be keypunched, the numbers of card columns in each field, and the program function to be used.
7. How many total strokes are there in each card?
8. How much time would be required to complete this keypunch assignment?

The following questions are to be answered from the text material only and not from the example in Fig. 6–15.

9. How should cards be removed from the center of the card bed? From the left of the card bed? From the punch or read station?
10. What is a fast method of spacing over columns? When is it not possible to use this method?
11. Cards with what kind of corner cuts should not be fed through the keypunch?
12. Explain the procedure for replacing the ribbon on either the 26 or 29 keypunch.
13. What is auxiliary duplication?
14. What is a card gauge and how is it used?

The following questions should be answered if using a model 29 keypunch.

15. How are errors corrected in a field programmed for left-zero insertion?
16. What is the program card coding and function for each operation when using program two?
17. What is the left-zero insertion program card coding for both program one and program two?

QUESTION CARDS

Figures 6–16 through 6–19 contain questions that are to be interpreted. Write the question and the answer to the question on a separate sheet of paper.

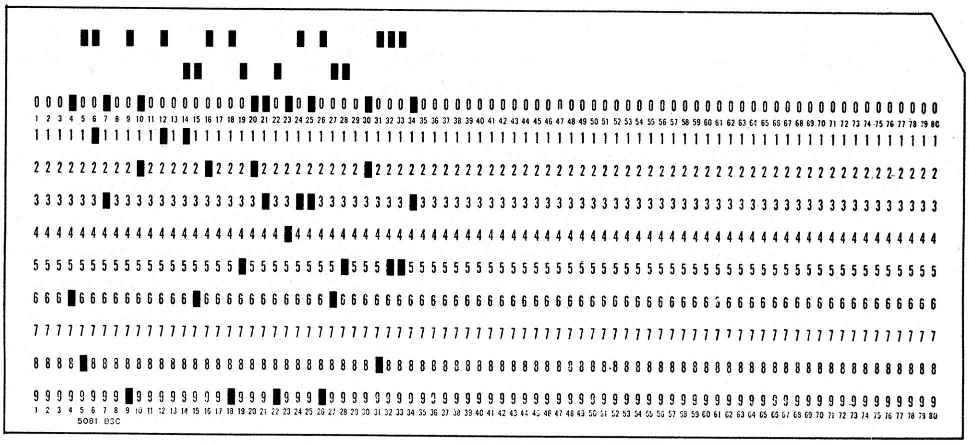


Fig. 6–16

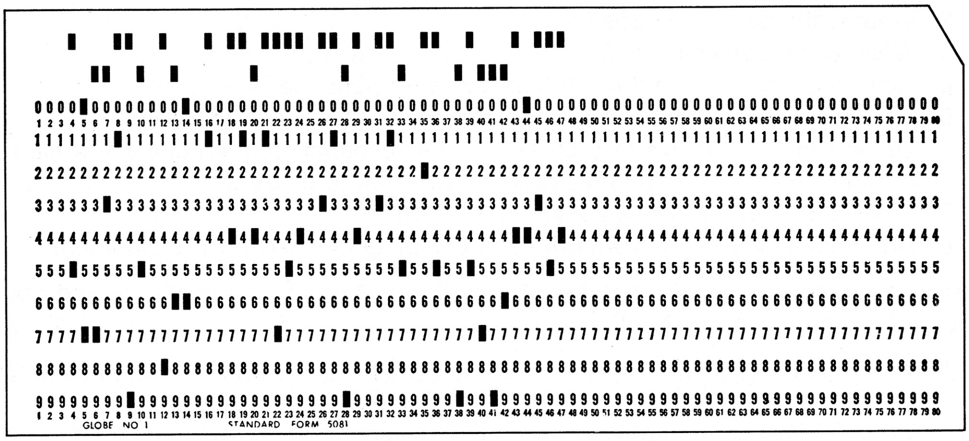

GLOBE NO 1
STANDARD FORM 5081

Fig. 6–17

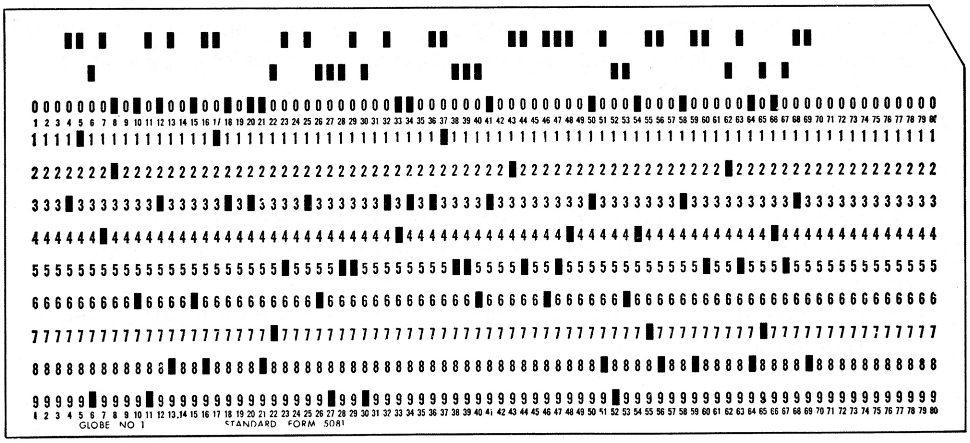

GLOBE NO 1
STANDARD FORM 5081

Fig. 6–18

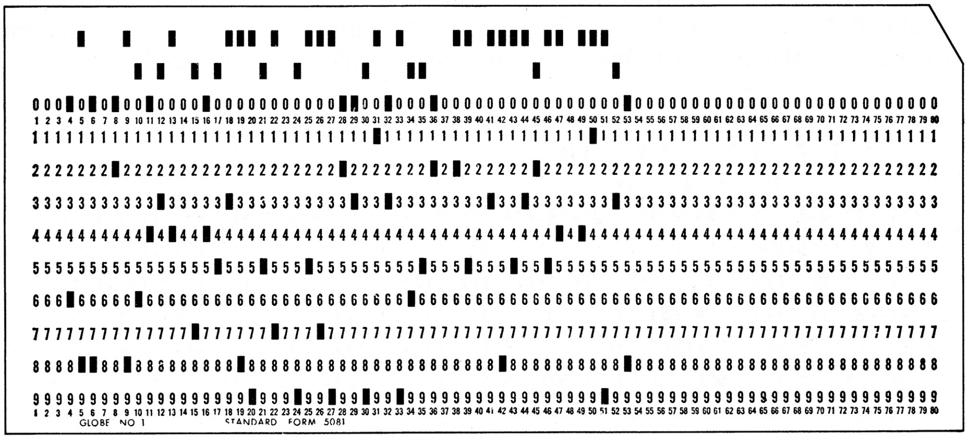

GLOBE NO 1
STANDARD FORM 5081

Fig. 6–19

PUNCHING COMPUTER PROGRAMS chapter 7

In many respects a computer system is quite similar to a unit record system in that punched cards may be used as input to the system and printed reports or punched cards may be produced as output. The main difference between the two lies in the manner of processing the data and the electronic equipment used in processing. Whereas the unit record system requires the physical movement of cards from one machine to another, the electronic computer system permits many processing functions to be performed in one operation.

The operations of preparing source documents, punching cards from source documents, and sorting punched cards for a computer system using punched cards for input are accomplished by the same methods used in the unit record type of installation. After information has been placed within the computer system, all data processing functions such as merging, calculating, and printing are performed by the computer instead of by individual machines. These operations are accomplished by means of a set of instructions called a *program,* which, when punched onto cards and fed into the computer system, controls all operations automatically from start to finish.

These computer programs are first written by programmers. The programmer's job is to analyze a particular problem in data processing and to transform the method used in solving the problem into a series of instructions that the computer can understand. These programs are written in what is called a *programming language.* Different computers require different programming languages. A programming language follows certain established rules of grammar and punctuation.

Programming is sometimes a laborious and time-consuming task. Often a program will consist of several hundred individual instructions, code tables, formulas, and other reference material. It is the keypunch operator's responsibility to read these handwritten computer programs as a source document and punch them into cards. Accuracy is extremely important because a single keypunch error will sometimes cause the whole operation to fail. All computer programs require knowledge of the special symbols found on the keyboard and should be reviewed before the programs are punched.

SPECIAL SYMBOLS ON THE 26 KEYPUNCH

To punch the lower symbol on any of the symbol keys, it is necessary to place the 26 keypunch (Fig. 7–1) into alphabetic shift; to punch the upper character, the

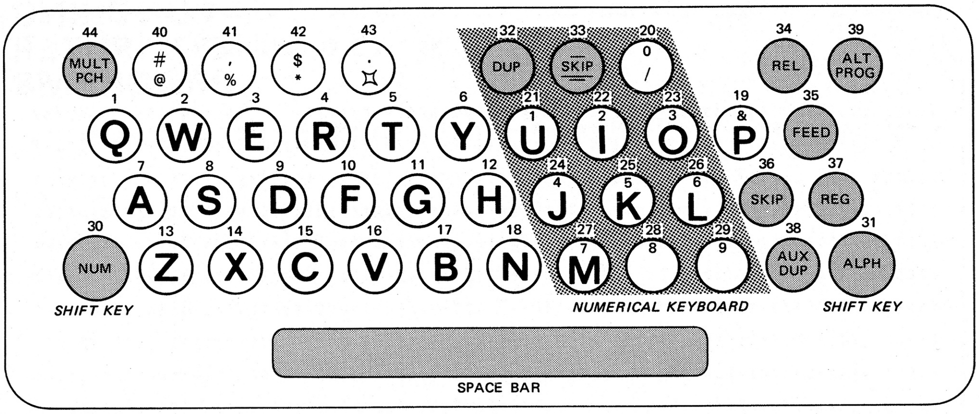

44 MULT PCH
40 # @
41 , %
42 $ *
43 . ⌑
32 DUP
33 SKIP
20 0 /
34 REL
39 ALT PROG
1 Q
2 W
3 E
4 R
5 T
6 Y
21 1 U
22 2 I
23 3 O
19 & P
35 FEED
7 A
8 S
9 D
10 F
11 G
12 H
24 4 J
25 5 K
26 6 L
36 SKIP
37 REG
30 NUM
13 Z
14 X
15 C
16 V
17 B
18 N
27 7 M
28 8
29 9
38 AUX DUP
31 ALPH
SHIFT KEY
NUMERICAL KEYBOARD
SHIFT KEY
SPACE BAR

Fig. 7–1 A 26 keyboard.

keypunch must be in numeric shift. It may be necessary to use the alpha and numeric shift keys to override the program control if it is used.

The proper finger usage for each of the special symbols is as follows:

@ and #	Use the S finger.
, and %	Use the D finger.
* and $	Use the F finger.
⌑ and .	Use the F finger.
	Use the K finger and strike the dash skip key.

SPECIAL SYMBOLS ON THE 29 KEYPUNCH

To punch the lower symbol on any of the symbol keys, it is necessary to place the 29 keypunch (Fig. 7–2) into alphabetic shift; to punch the upper character, the keypunch must be in alphabetic shift. It may be necessary to use the alpha and numeric shift keys to override the program control if it is used. It should be noted at this time that the period appears on the same key as the < on the top row of keys; this period is a numeric punch. The period also appears on the same key as the digit 9 on the bottom row of keys; this period is an alpha punch. The comma at the top left on the same key as the % is a numeric punch. The comma at the bottom on the digit 8 key is an alpha punch.

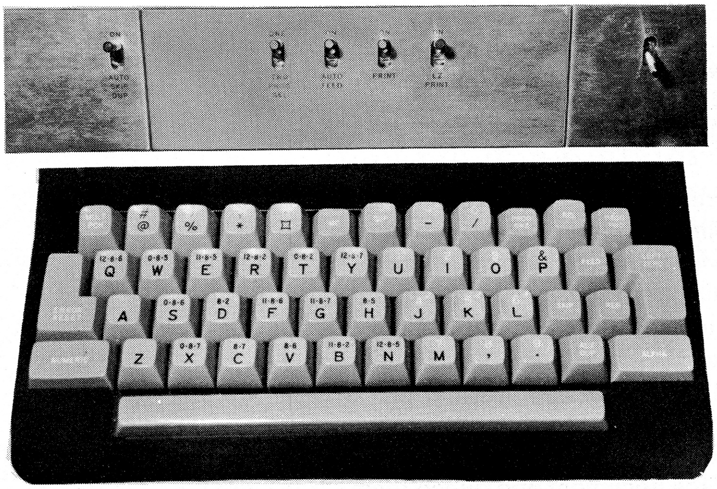


Fig. 7–2 A 29 keyboard.

The proper finger usage for each of the special symbols is as follows:

@ and #	Use the S finger.
% and ,	Use the D finger.
* and $	Use the F finger.
-	Use the K finger.
/	Use the L finger.

It should be noted that many of the special symbols do not retain the position they have on the typewriter.

COMPUTER LANGUAGES

Some of the programming languages keypunch operators may be asked to keypunch are SPS, FORTRAN, RPG, and COBOL.

SPS (Symbolic Programming Systems) requires one instruction for every computer operation. Figure 7–3 is an example of an SPS instruction.

Another important programming language is FORTRAN (Formula Translation). This language was developed primarily for scientific and mathematic applications. Figure 7–4 is an example of a FORTRAN instruction.

RPG (Report Program Generator) is gaining more and more popularity. The primary purpose of RPG was to provide a quick and easy method of writing programs for personnel, progressing from unit record systems to the IBM System 360. It seems, however, that the programming system is powerful enough to satisfy most of the programming requirements of a majority of the written reports by most commercial computer installations. See Fig. 7–5.

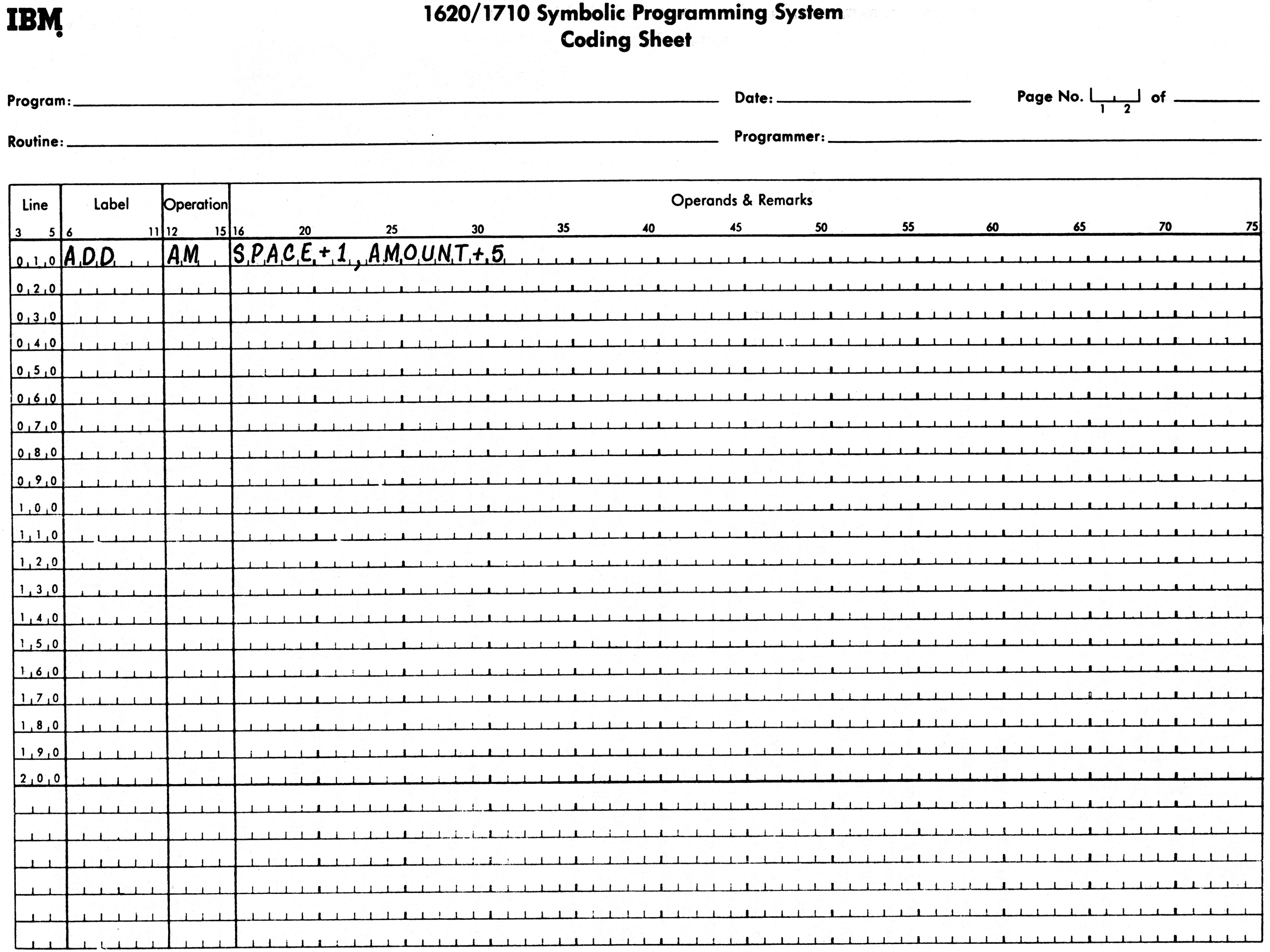
COBOL (Common Business Oriented Language) is probably the most common of the programming languages. Because COBOL was developed through the joint efforts of computer manufacturers and users, in cooperation with the United States Department of Defense, most computers can understand and operate with a COBOL program. See Fig. 7–6.

Punching an SPS Program

Figure 7–7 is an example coding sheet that a keypunch operator may have to read as a source document in punching an SPS program. Figure 7–8 illustrates the card that is to be used in punching the SPS program. This particular card is one that can be used by a 26 keypunch and has the fields of the card to be interpreted above row 12. The second level of interpreting may tend to be confusing, but this level is designed for interpreting by an interpreter in the event 24 keypunches (nonprinting) are used. Note that the format of the input card follows the heading on the coding sheet. The card columns that are assigned to a single heading are referred to as fields. The following is a discussion of each field found on the coding sheet and what is to be punched on the card.

Program, date, routing programmer. These fields are found on the coding sheet but are not to be punched on the card.

Page number. The page number field, found at the right side of the coding sheet on the top line, is the first field to be punched on the card. Notice that it is to be punched in card columns 1 and 2. Notice that the digits 1 and 2 appear beneath the area, signifying where the page number is to be written by the programmer. A quick glance will show that each and every card column is indicated and that certain specific information is to be written within certain assigned areas and to be punched into certain assigned card columns.



IBM

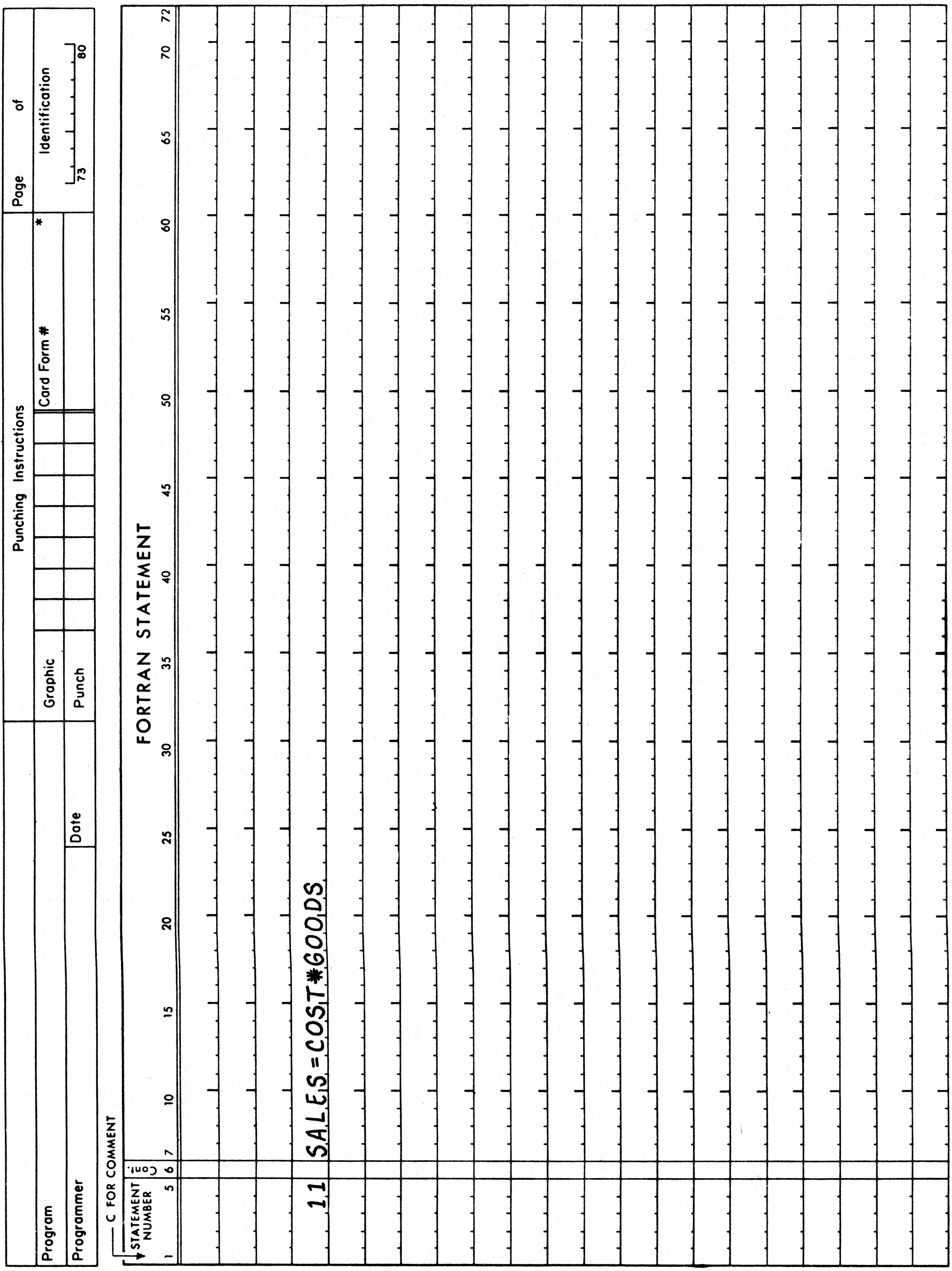
1620/1710 Symbolic Programming System
Coding Sheet

Program: ______ Date: ______ Page No. ☐☐ of ______

Routine: ______ Programmer: ______

Line (3–5)	Label (6–11)	Operation (12–15)	Operands & Remarks (16–75)
010	ADD	AM	SPACE+1,AMOUNT+5
020			
030			
040			
050			
060			
070			
080			
090			
100			
110			
120			
130			
140			
150			
160			
170			
180			
190			
200			

Fig. 7–3 SPS instruction example.



FORTRAN CODING FORM

Program

Programmer

Date

Punching Instructions

Graphic

Punch

Card Form #

*

Page of

Identification

73 80

C FOR COMMENT

STATEMENT NUMBER

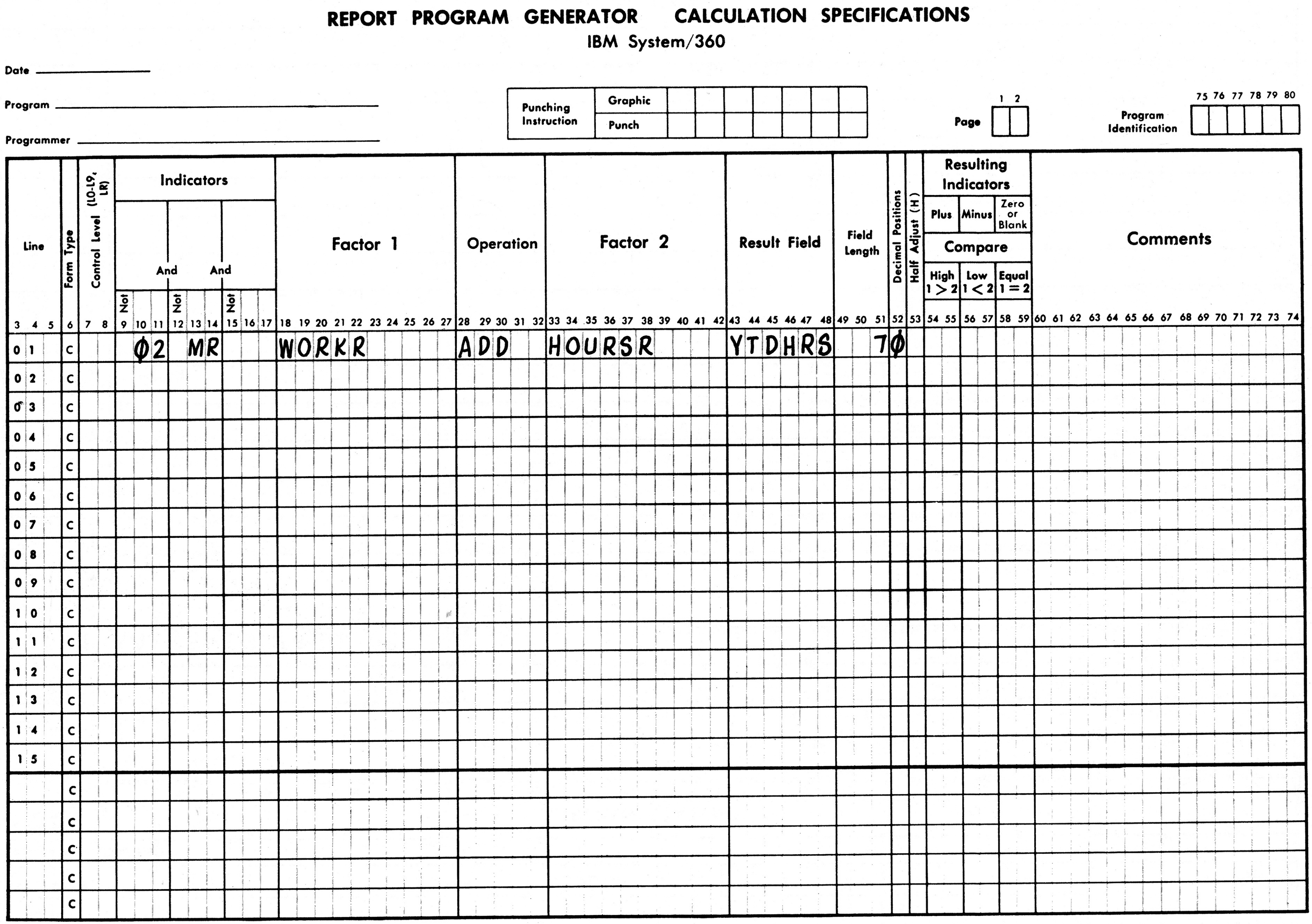
CONT.

FORTRAN STATEMENT

1 5 6 7 10 15 20 25 30 35 40 45 50 55 60 65 70 72

```
   11 SALES=COST*GOODS
```

Fig. 7–4 FORTRAN instruction example.



REPORT PROGRAM GENERATOR CALCULATION SPECIFICATIONS
IBM System/360

Date ____________
Program ____________
Programmer ____________

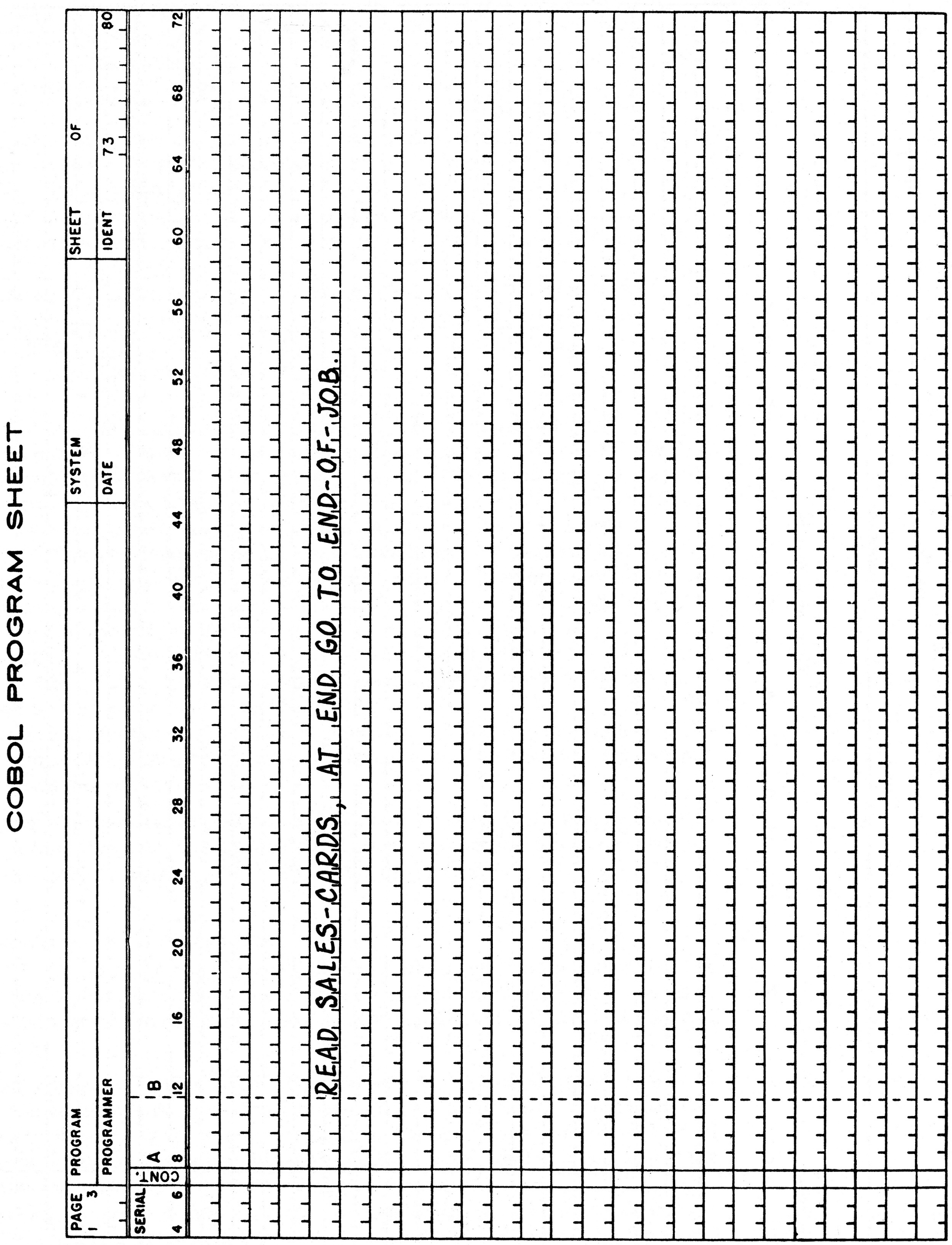
Punching Instruction							
Graphic							
Punch							

Page (1 2) ☐☐

Program Identification (75 76 77 78 79 80) ☐☐☐☐☐☐

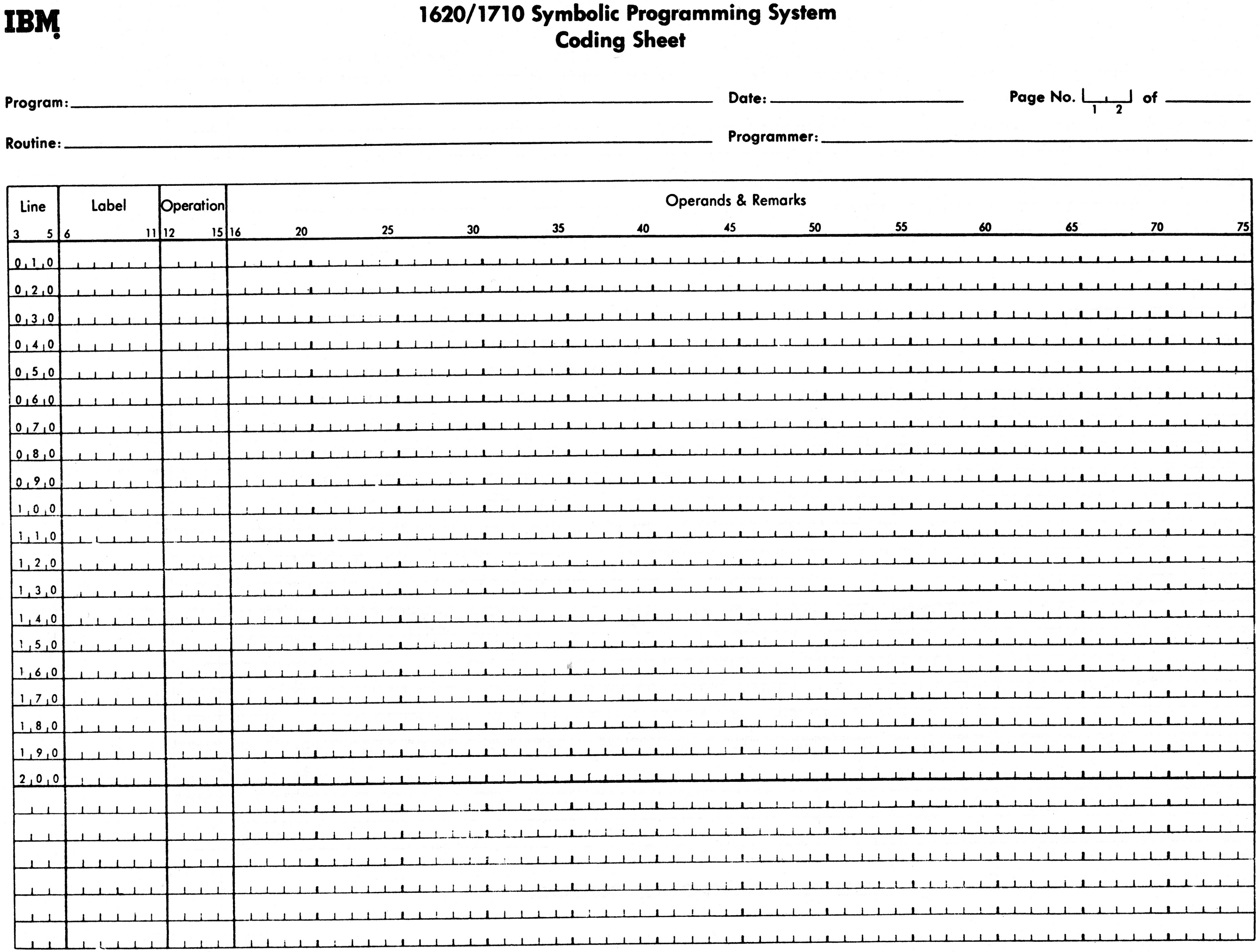
Line 3 4 5	Form Type 6	Control Level (L0-L9, LR) 7 8	Indicators Not 9	 10 11	And Not 12	 13 14	And Not 15	 16 17	Factor 1 18–27	Operation 28–32	Factor 2 33–42	Result Field 43–48	Field Length 49 50 51	Decimal Positions 52	Half Adjust (H) 53	Resulting Indicators: Plus / Compare: High 1 > 2 54 55	Resulting Indicators: Minus / Compare: Low 1 < 2 56 57	Resulting Indicators: Zero or Blank / Compare: Equal 1 = 2 58 59	Comments 60–74
0 1	C			02		MR			WORKR	ADD	HOURSR	YTDHRS	7	0					
0 2	C																		
0 3	C																		
0 4	C																		
0 5	C																		
0 6	C																		
0 7	C																		
0 8	C																		
0 9	C																		
1 0	C																		
1 1	C																		
1 2	C																		
1 3	C																		
1 4	C																		
1 5	C																		
	C																		
	C																		
	C																		
	C																		
	C																		

Fig. 7–5 RPG instruction example.


COBOL PROGRAM SHEET
PAGE
1 3
PROGRAM
PROGRAMMER
SYSTEM
DATE
SHEET
OF
IDENT
73
80
SERIAL
4
6
CONT.
A
8
B
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72

READ SALES-CARDS, AT END GO TO END-OF-JOB.

Fig. 7-6 COBOL instruction example.



IBM

1620/1710 Symbolic Programming System
Coding Sheet

Program: ______ Date: ______ Page No. ⎣_1_2_⎦ of ______

Routine: ______ Programmer: ______

Line	Label	Operation	Operands & Remarks
3 5	6 11	12 15	16 20 25 30 35 40 45 50 55 60 65 70 75
0 1 0			
0 2 0			
0 3 0			
0 4 0			
0 5 0			
0 6 0			
0 7 0			
0 8 0			
0 9 0			
1 0 0			
1 1 0			
1 2 0			
1 3 0			
1 4 0			
1 5 0			
1 6 0			
1 7 0			
1 8 0			
1 9 0			
2 0 0			

Fig. 7–7 SPS coding sheet.

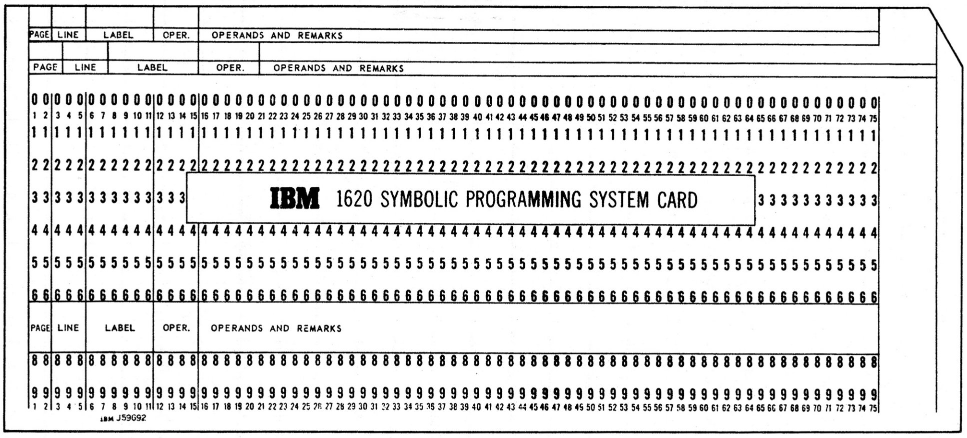

PAGE LINE LABEL OPER. OPERANDS AND REMARKS
IBM 1620 SYMBOLIC PROGRAMMING SYSTEM CARD
IBM J59092

Fig. 7–8 SPS **card for punching** SPS **programs.**

Line. The line field consists of a three-digit line number that is to be punched into card columns 3, 4, and 5 and is actually preprinted on the coding sheet. The first 20 lines are numbered 010, 020, 030, etc., through 200. There are also six non-numbered lines at the bottom of the sheet. These are provided for inserts for the programmer and the line number will be handwritten by the programmer.

Label. The label field may be left blank, in which case the operator may skip the field or fill it with a symbolic address. A label may consist of up to six alphameric characters and must begin in card column 6. The field extends to card column 11, but some of it may be left blank.

Operation. The operation field is a four-card column field to be punched in card columns 12 to 15. The first character of the operation code must start in card column 12, and unused card columns may be left blank.

Operands and remarks. This field may be left blank or only partially filled on the source document. If punching is to be placed in the card for operands and remarks, it must begin in card column 16.

Figure 7–9 illustrates a small SPS program and the cards that are to be punched from it. Note that each line on the coding sheet requires that a card be punched. Note also that the page number is duplicated on each page.

Punching a FORTRAN Program

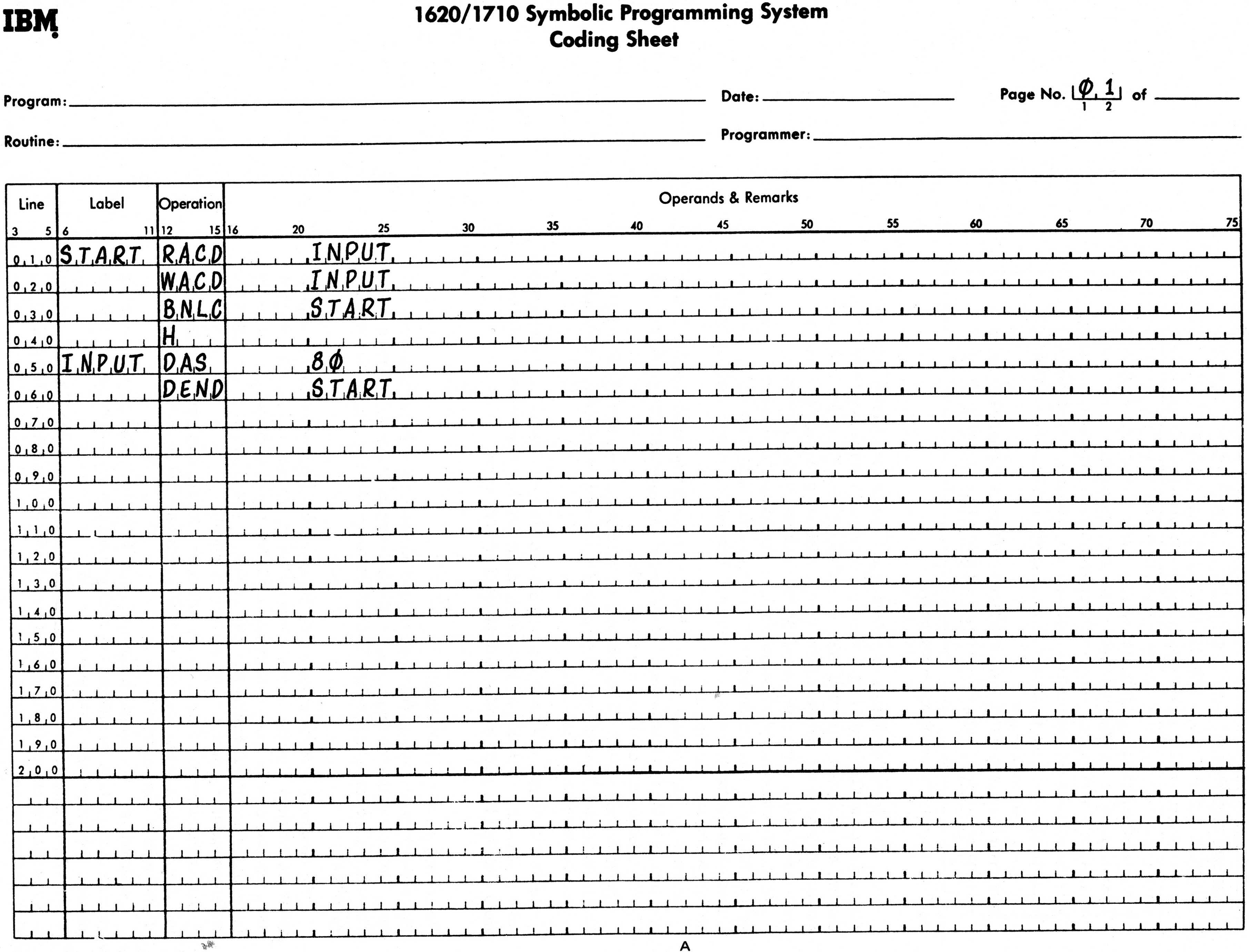
Figure 7–10 shows the FORTRAN coding form and the card to be punched from this form. Notice that the top three lines on the coding form do not appear on the card. These fields are not to be punched. The fields to be punched on the card are defined as follows:

C for comment. Many times a program may have a comment card to explain what the program is doing. In the FORTRAN coding system a C in card column 1 identifies this card as being a comment card. The actual comment is punched in columns 2 through 72. Notice that card column 1 is also part of a field called the *statement number.* Figure 7–11 illustrates a comment card.

Statement number. Card columns 1 through 5 may or may not contain punching. If numbers are to be given to a particular statement (a line on the coding form), it will begin in card column 1.

Continuation. If a particular statement is so long that it does not fit on one line (or one card), it is to be indicated as such in card column 6. A statement may be continued on four cards if necessary.

FORTRAN *statement.* Card columns 7 through 72 are used to contain the FORTRAN statement. Not all these card columns are always used; it depends on the particular statement.



IBM

1620/1710 Symbolic Programming System
Coding Sheet

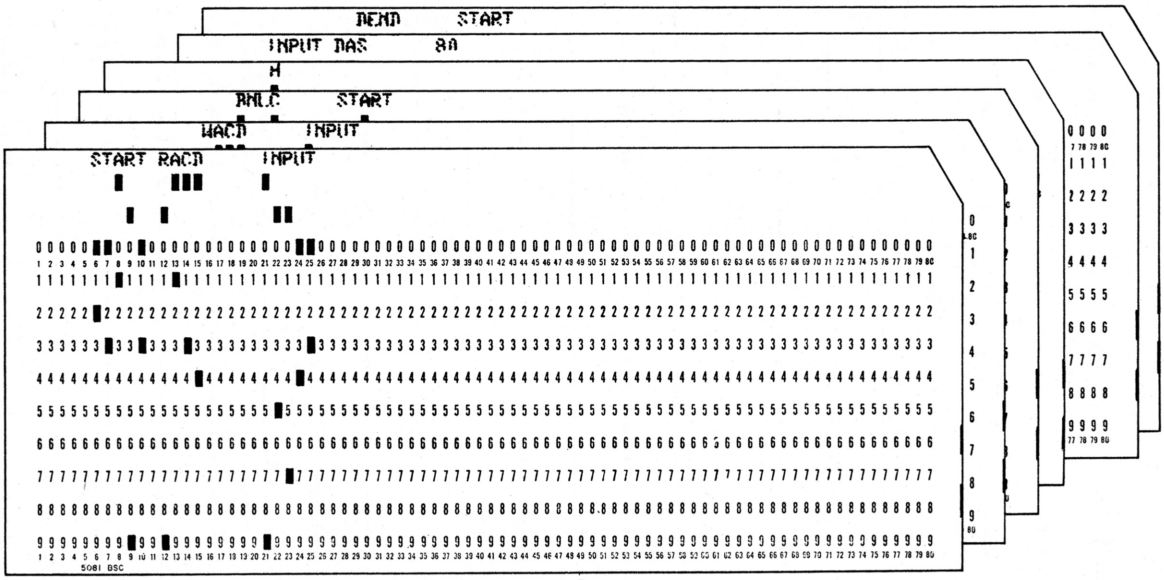
Program: ______ Date: ______ Page No. 01 of ______

Routine: ______ Programmer: ______

Line 3 5	Label 6 11	Operation 12 15	Operands & Remarks 16 … 75
010	START	RACD	INPUT
020		WACD	INPUT
030		BNLC	START
040		H	
050	INPUT	DAS	80
060		DEND	START
070			
080			
090			
100			
110			
120			
130			
140			
150			
160			
170			
180			
190			
200			

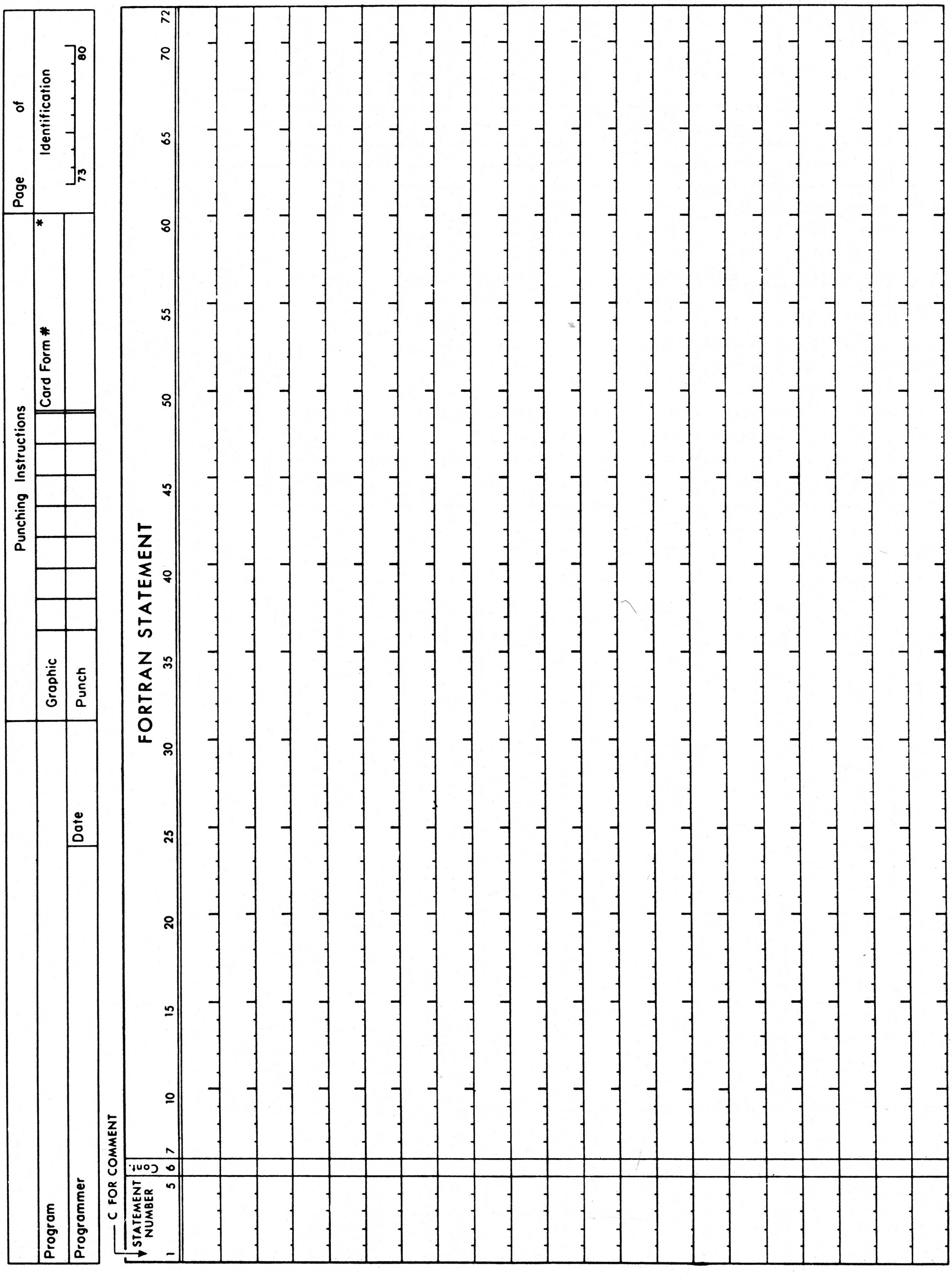
A

Fig. 7–9A, SPS program.


DEND START
INPUT DAS 80
H
BNLC START
WACD INPUT
START RACD INPUT
5081 DSC

B

Fig. 7–9B, cards.



FORTRAN CODING FORM

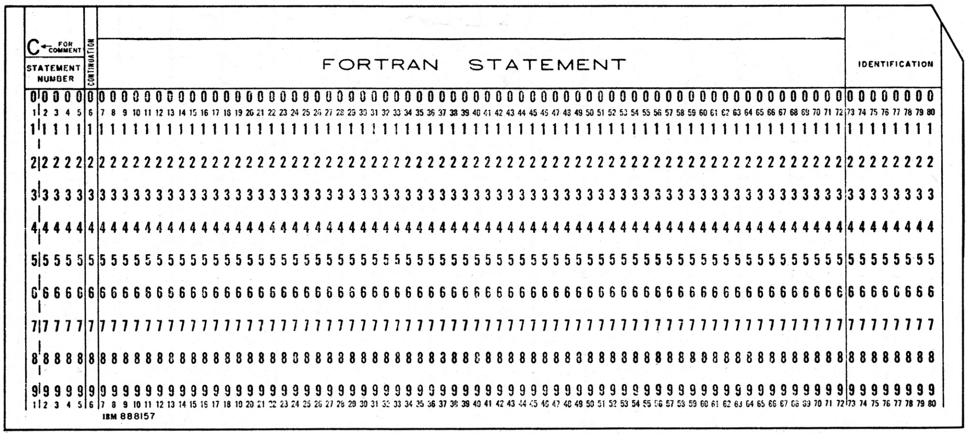
Program
Programmer
Date
Punching Instructions
Graphic
Punch
Card Form #
*
Page of
Identification
73 80

C FOR COMMENT
STATEMENT NUMBER
CONT.
FORTRAN STATEMENT

1 5 6 7 10 15 20 25 30 35 40 45 50 55 60 65 70 72

A

Fig. 7–10A, FORTRAN coding form.


C ← FOR COMMENT
STATEMENT NUMBER
CONTINUATION
FORTRAN STATEMENT
IDENTIFICATION
IBM 888157

B

Fig. 7–10B, card.

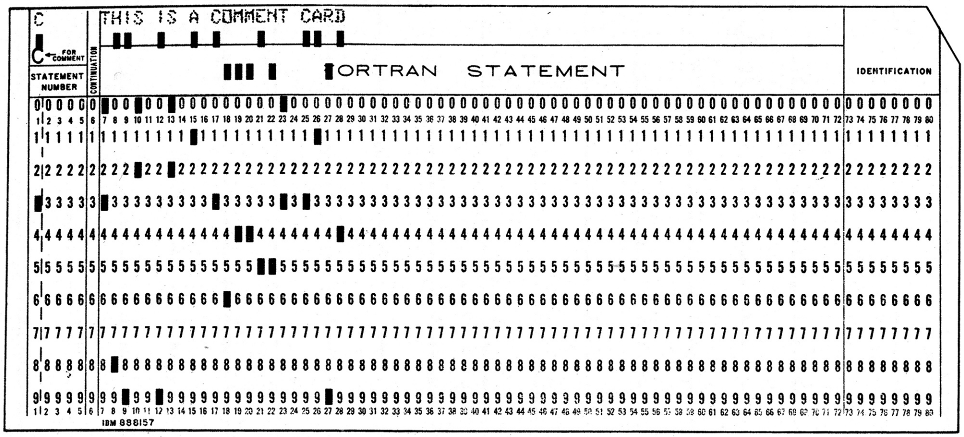

C
THIS IS A COMMENT CARD
C ← FOR COMMENT
STATEMENT NUMBER
CONTINUATION
FORTRAN STATEMENT
IDENTIFICATION
IBM 888157

Fig. 7–11 Comment card.

Identification. Card columns 73 through 80 are used to contain information of identification and sequencing. They may be left blank.

See Fig. 7–12 for a brief FORTRAN program and the cards punched from this program.

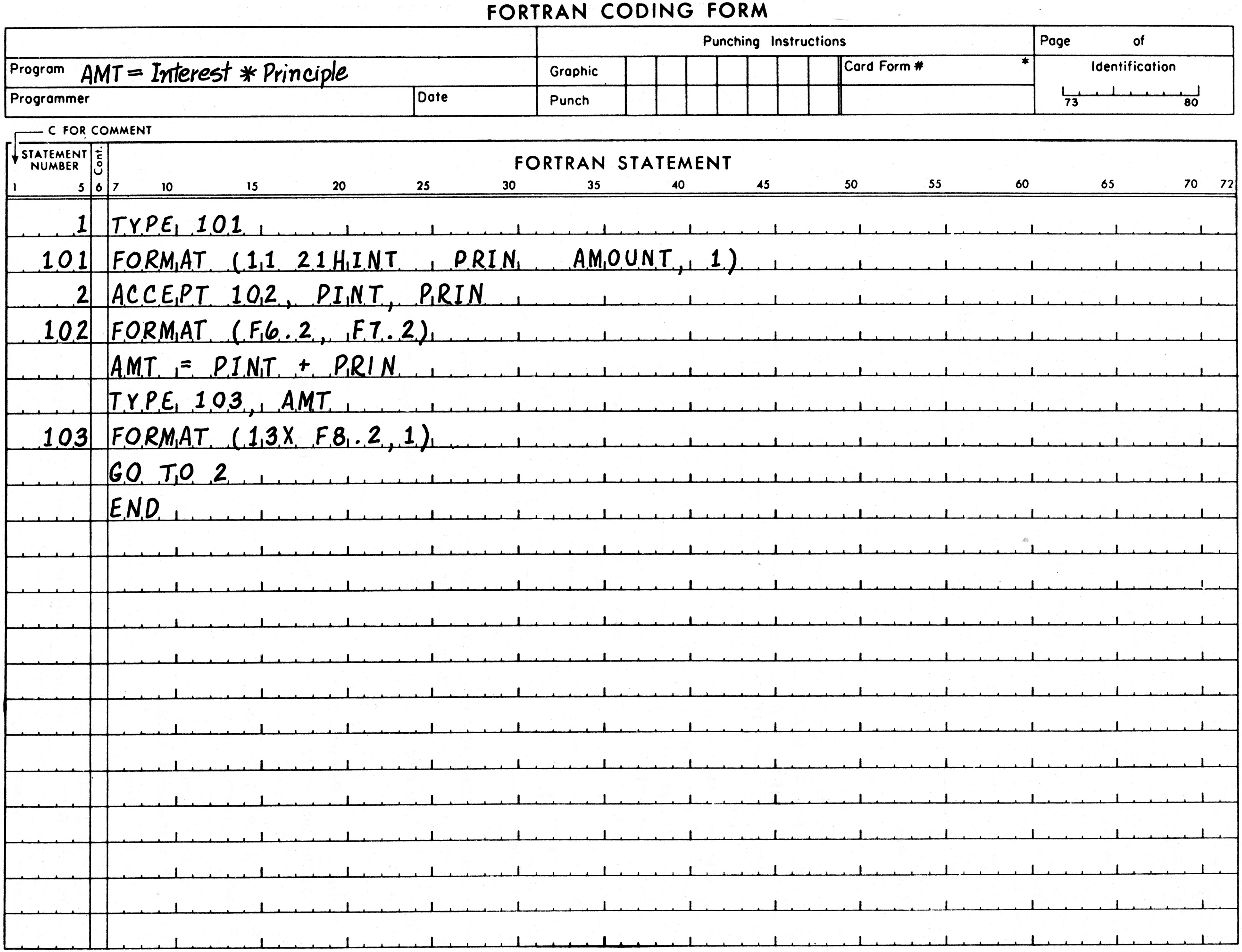
Punching an RPG Program

RPG programs require more than one type of form (Fig. 7–13). There are five forms used in a typical RPG program:

File description specifications
File extension specifications
Input specifications
Calculation specifications
Output-format specifications

As in the other programming languages the card columns that are to contain certain fields are indicated on the forms and one line on a form indicates that one card is to be punched.

Figure 7–14 illustrates a program written in RPG that will reproduce cards. Because the program does not require file extension specifications or calculation specifications, they are not shown.



FORTRAN CODING FORM

Program AMT = Interest * Principle

Programmer

Date

Punching Instructions

Graphic

Punch

Card Form #

Page of

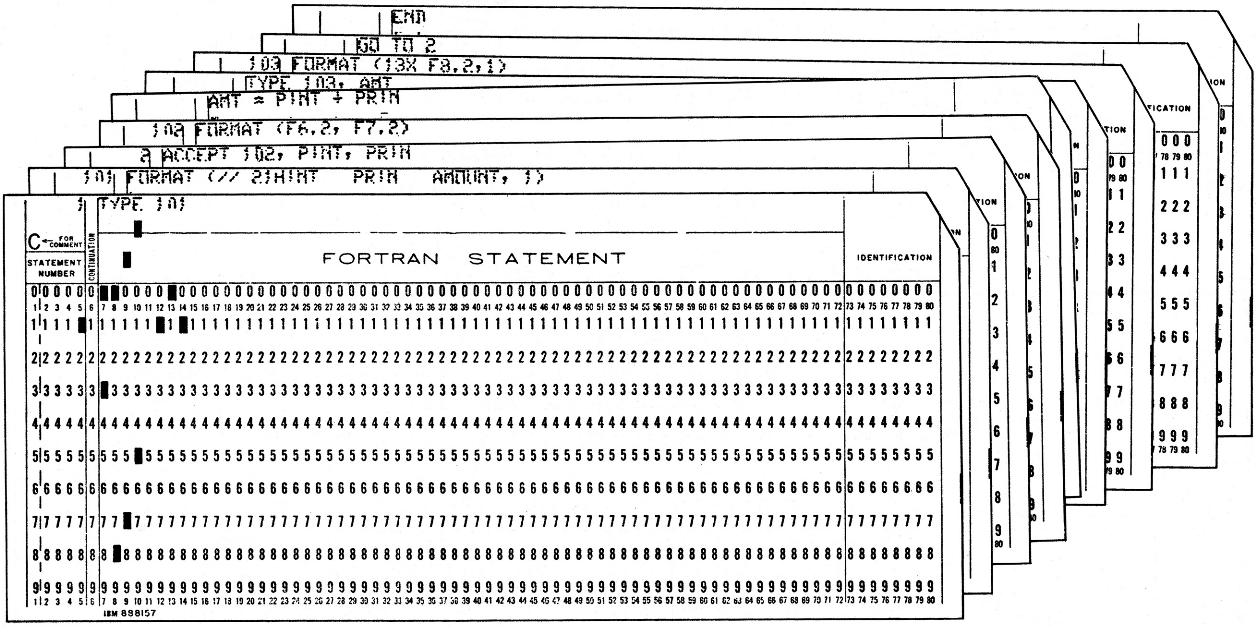
Identification 73 80

C FOR COMMENT

STATEMENT NUMBER 1 5 | Cont. 6 | FORTRAN STATEMENT 7 10 15 20 25 30 35 40 45 50 55 60 65 70 72

```
    1 TYPE 101
  101 FORMAT (11 21HINT   PRIN   AMOUNT, 1)
    2 ACCEPT 102, PINT, PRIN
  102 FORMAT (F6.2, F7.2)
      AMT = PINT + PRIN
      TYPE 103, AMT
  103 FORMAT (13X F8.2, 1)
      GO TO 2
      END
```

Fig. 7–12A, FORTRAN program.

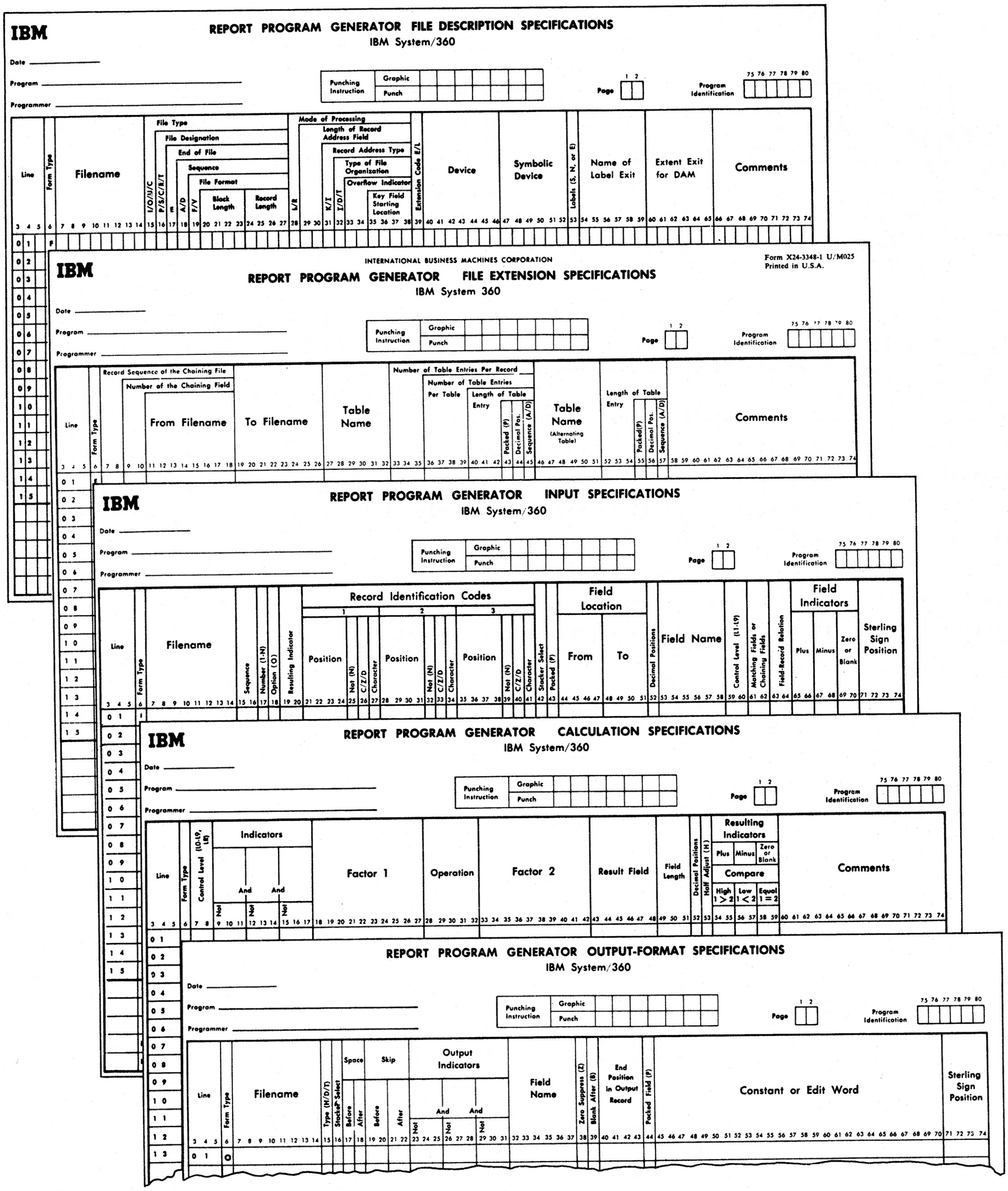


```
    1 TYPE 101
  101 FORMAT (// 21HINT   PRIN   AMOUNT, 1)
    2 ACCEPT 102, PINT, PRIN
  102 FORMAT (F6.2, F7.2)
      AMT = PINT + PRIN
      TYPE 103, AMT
  103 FORMAT (13X F8.2,1)
      GO TO 2
      END
```

C ← FOR COMMENT
STATEMENT NUMBER
CONTINUATION
FORTRAN STATEMENT
IDENTIFICATION
IBM 888157

B

Fig. 7–12B, cards.



IBM

REPORT PROGRAM GENERATOR FILE DESCRIPTION SPECIFICATIONS
IBM System/360

Date
Program
Programmer

Punching Instruction: Graphic / Punch
Page
Program Identification

Line | Form Type | Filename | File Type | File Designation | End of File | Sequence | File Format | Block Length | Record Length | Mode of Processing | Length of Record Address Field | Record Address Type | Type of File Organization | Overflow Indicator | Key Field Starting Location | Extension Code E/L | Device | Symbolic Device | Labels (S, N, or E) | Name of Label Exit | Extent Exit for DAM | Comments

---

IBM

INTERNATIONAL BUSINESS MACHINES CORPORATION
Form X24-3348-1 U/M025
Printed in U.S.A.

REPORT PROGRAM GENERATOR FILE EXTENSION SPECIFICATIONS
IBM System 360

Date
Program
Programmer

Punching Instruction: Graphic / Punch
Page
Program Identification

Line | Form Type | Record Sequence of the Chaining File | Number of the Chaining Field | From Filename | To Filename | Table Name | Number of Table Entries Per Record | Number of Table Entries Per Table | Length of Table Entry | Packed (P) | Decimal Pos. | Sequence (A/D) | Table Name (Alternating Table) | Length of Table Entry | Packed (P) | Decimal Pos. | Sequence (A/D) | Comments

---

IBM

REPORT PROGRAM GENERATOR INPUT SPECIFICATIONS
IBM System/360

Date
Program
Programmer

Punching Instruction: Graphic / Punch
Page
Program Identification

Line | Form Type | Filename | Sequence | Number (1-N) | Option (O) | Resulting Indicator | Record Identification Codes 1, 2, 3: Position, Not (N), C/Z/D, Character | Stacker Select | Packed (P) | Field Location: From, To | Decimal Positions | Field Name | Control Level (L1-L9) | Matching Fields or Chaining Fields | Field-Record Relation | Field Indicators: Plus, Minus, Zero or Blank | Sterling Sign Position

---

IBM

REPORT PROGRAM GENERATOR CALCULATION SPECIFICATIONS
IBM System/360

Date
Program
Programmer

Punching Instruction: Graphic / Punch
Page
Program Identification

Line | Form Type | Control Level (L0-L9, LR) | Indicators: Not, And, Not, And, Not | Factor 1 | Operation | Factor 2 | Result Field | Field Length | Decimal Positions | Half Adjust (H) | Resulting Indicators: Plus, Minus, Zero or Blank; Compare: High 1 > 2, Low 1 < 2, Equal 1 = 2 | Comments

---

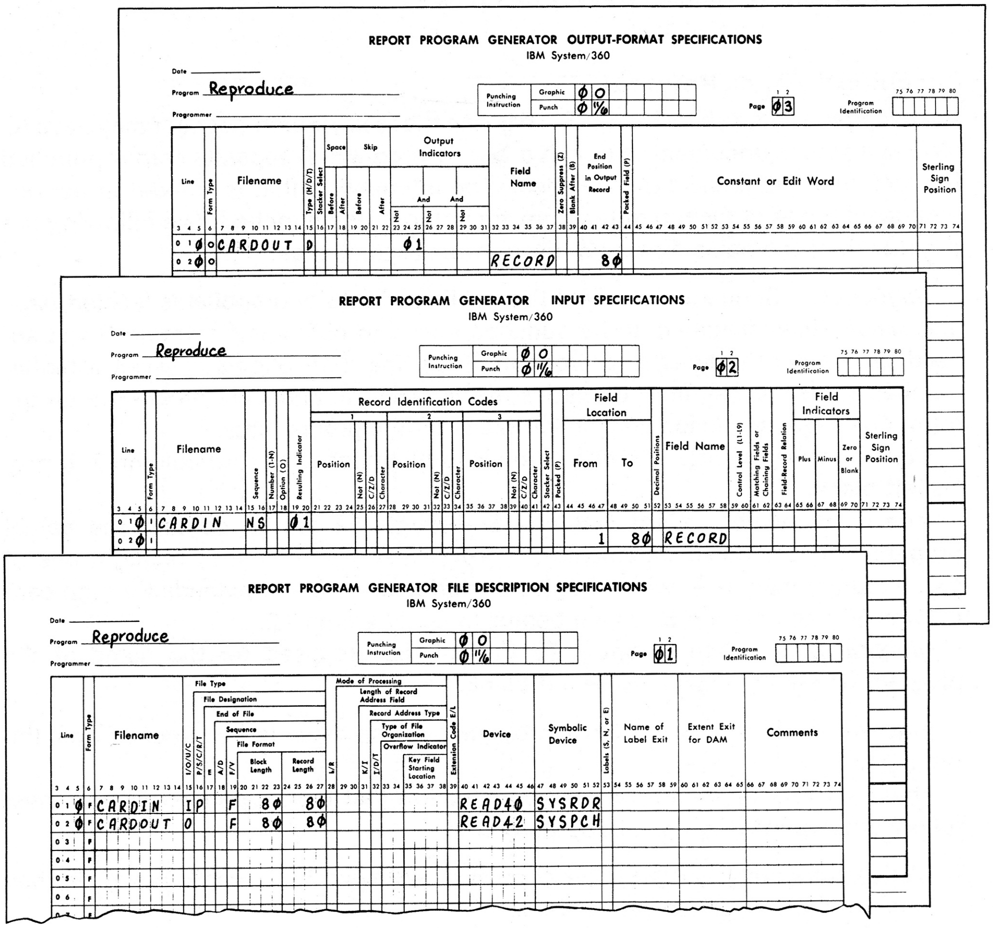
REPORT PROGRAM GENERATOR OUTPUT-FORMAT SPECIFICATIONS
IBM System/360

Date
Program
Programmer

Punching Instruction: Graphic / Punch
Page
Program Identification

Line | Form Type | Filename | Type (H/D/T) | Stacker Select | Space: Before, After | Skip: Before, After | Output Indicators: Not, And, Not, And, Not | Field Name | Zero Suppress (Z) | Blank After (B) | End Position in Output Record | Packed Field (P) | Constant or Edit Word | Sterling Sign Position

Fig. 7-13 Example of various RPG forms.



REPORT PROGRAM GENERATOR OUTPUT-FORMAT SPECIFICATIONS
IBM System/360

Program: Reproduce
Punching Instruction: Graphic 0 O; Punch 0 11/6
Page: 03

Line	Form Type	Filename	Type (H/D/T)	Output Indicators	Field Name	End Position in Output Record
01	O	CARDOUT	D	01		
02	O				RECORD	80

REPORT PROGRAM GENERATOR INPUT SPECIFICATIONS
IBM System/360

Program: Reproduce
Punching Instruction: Graphic 0 O; Punch 0 11/6
Page: 02

Line	Form Type	Filename	Sequence	Resulting Indicator	Field Location From	Field Location To	Field Name
01	I	CARDIN	NS	01			
02	I				1	80	RECORD

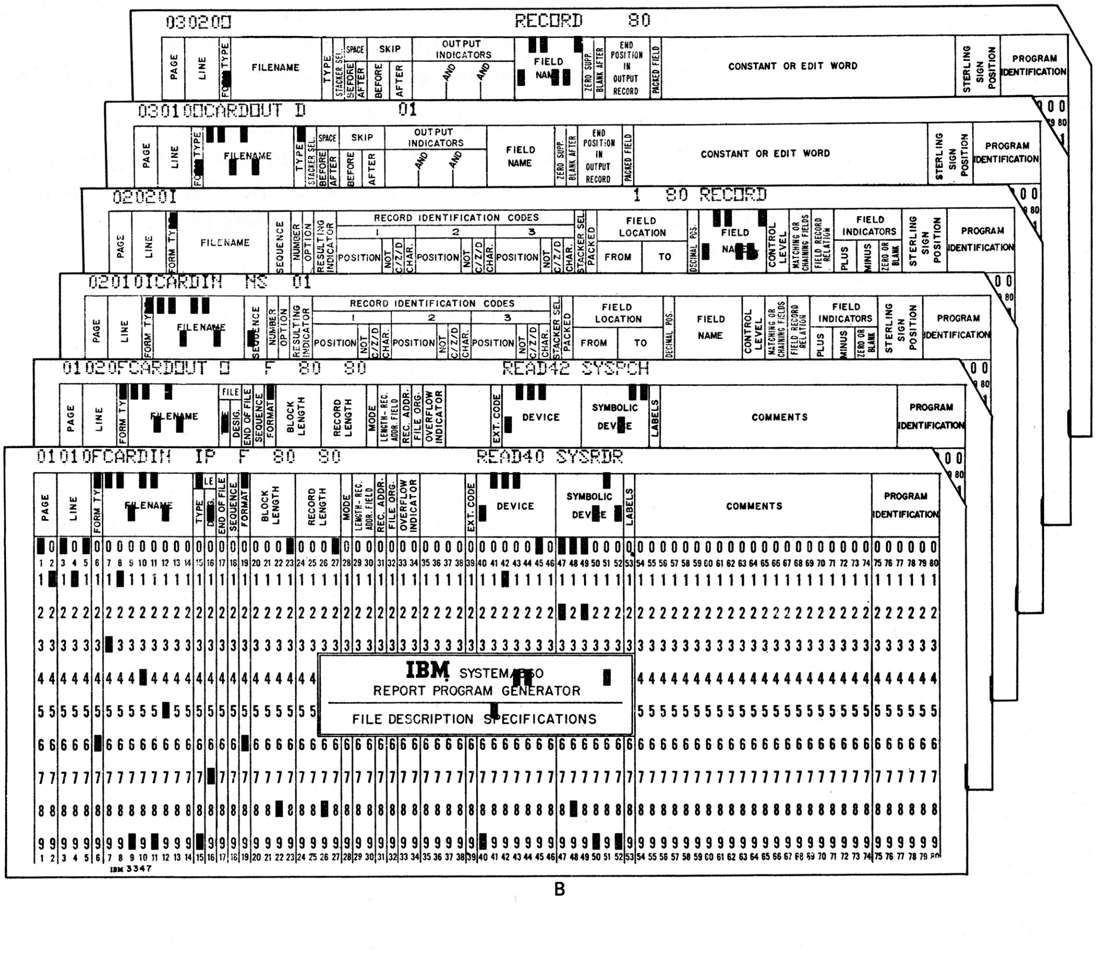
REPORT PROGRAM GENERATOR FILE DESCRIPTION SPECIFICATIONS
IBM System/360

Program: Reproduce
Punching Instruction: Graphic 0 O; Punch 0 11/6
Page: 01

Line	Form Type	Filename	File Type	File Designation	File Format	Block Length	Record Length	Device	Symbolic Device
01	F	CARDIN	I	P	F	80	80	READ40	SYSRDR
02	F	CARDOUT	O		F	80	80	READ42	SYSPCH
03	F								
04	F								
05	F								
06	F								

A

Fig. 7–14 A, RPG program; B, cards.



```
030200O                                RECORD   80
03010OCARDOUT D        01
02020I                                      1  80 RECORD
02010ICARDIN  NS  01
01020FCARDOUT O   F  80  80              READ42 SYSPCH
01010FCARDIN  IP  F  80  80              READ40 SYSRDR
```

B

Punching a COBOL Program

The example coding sheet in Fig. 7–15 is one that a keypunch operator may have to read as a source document to punch a COBOL program. A separate card is punched for each line that is used on the sheet. The information that is entered in the unnumbered boxes at the top of the form are not to be keypunched. The following is a discussion of the fields found on the COBOL program sheet.

Sequence. Sequence is a field that is divided into two subfields labeled *page* and *serial.* These fields are to be punched into card columns 1 through 6 and are used to number the lines of a program. Each line that follows is given a higher number. Note that the first two digits of the serial numbers are preprinted on the form. The sequence fields may be left blank by the programmer.

Cont. (Continuation). Continuation is to be punched in card column 7. It may be left blank.

COBOL *statement.* Card columns 8 through 72 are to contain the actual program entiries. These statements are grouped so that they may begin in one of two margins: margin A, which begins in card column 8 and extends through card column 11; and margin B, which begins in card column 12.

Identification. Card columns 73 through 80 are used for the name of the program. These columns may be left blank.

Figure 7–16 illustrates a COBOL program and the cards to be punched from the program.

There are four important rules of punctuation that the keypunch operator must follow when punching the COBOL program:

1. Periods, commas, and semicolons must be followed by a space; however, they must not have a space before them.
2. A left parenthesis must not be followed by a space; however, it must be preceded by a space.
3. A right parenthesis must be followed by either a space or by a period, comma, or semicolon; it must not be preceded by a space.
4. Arithmetic symbols and equal signs must be preceded and followed by a space.

It is important that all punctuation marks such as hyphens and commas be punched exactly as written by the programmer. Sometimes well-meaning keypunch operators with a good understanding of the English language change the punctuation marks to make the COBOL statement grammatically correct; this can be disastrous.

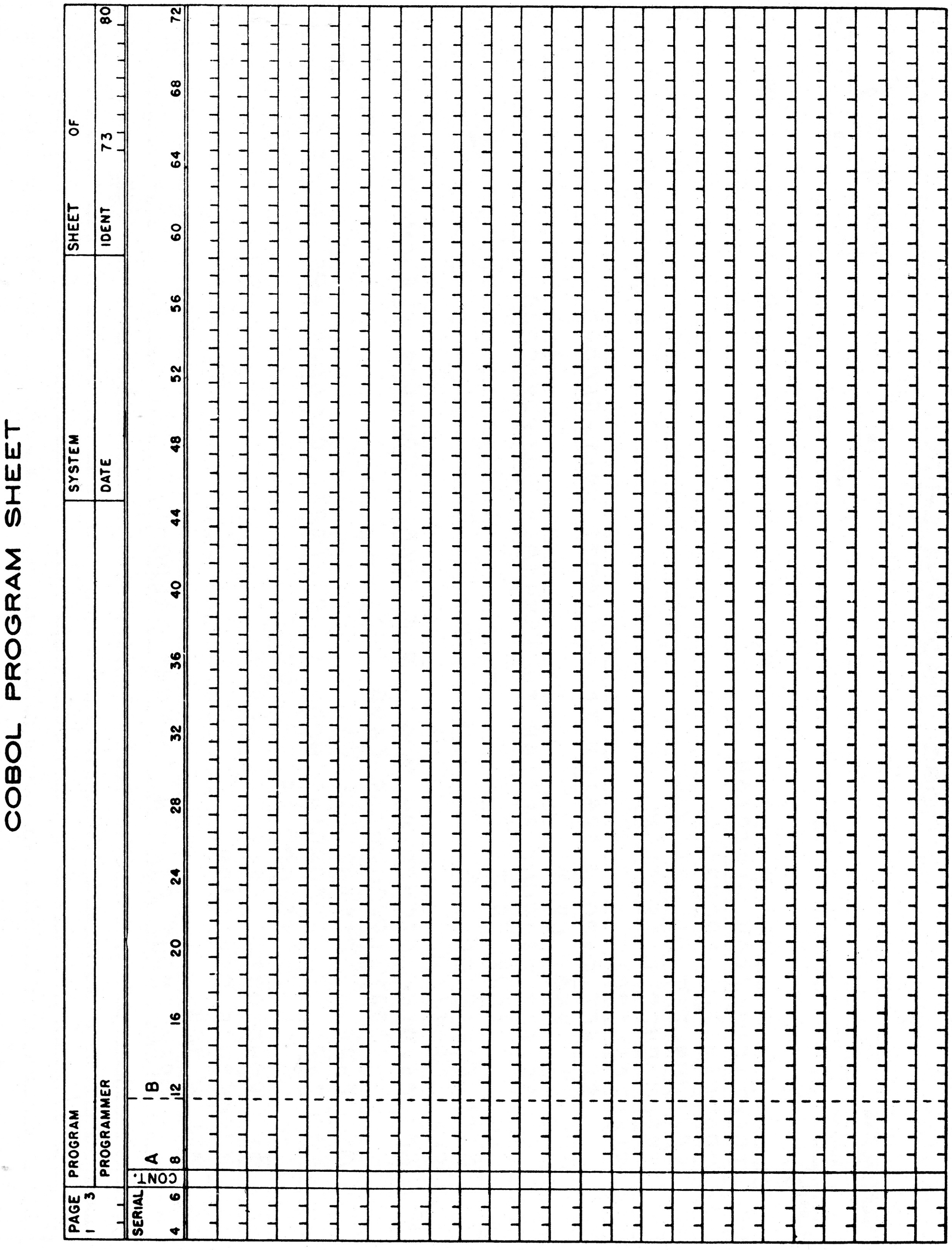
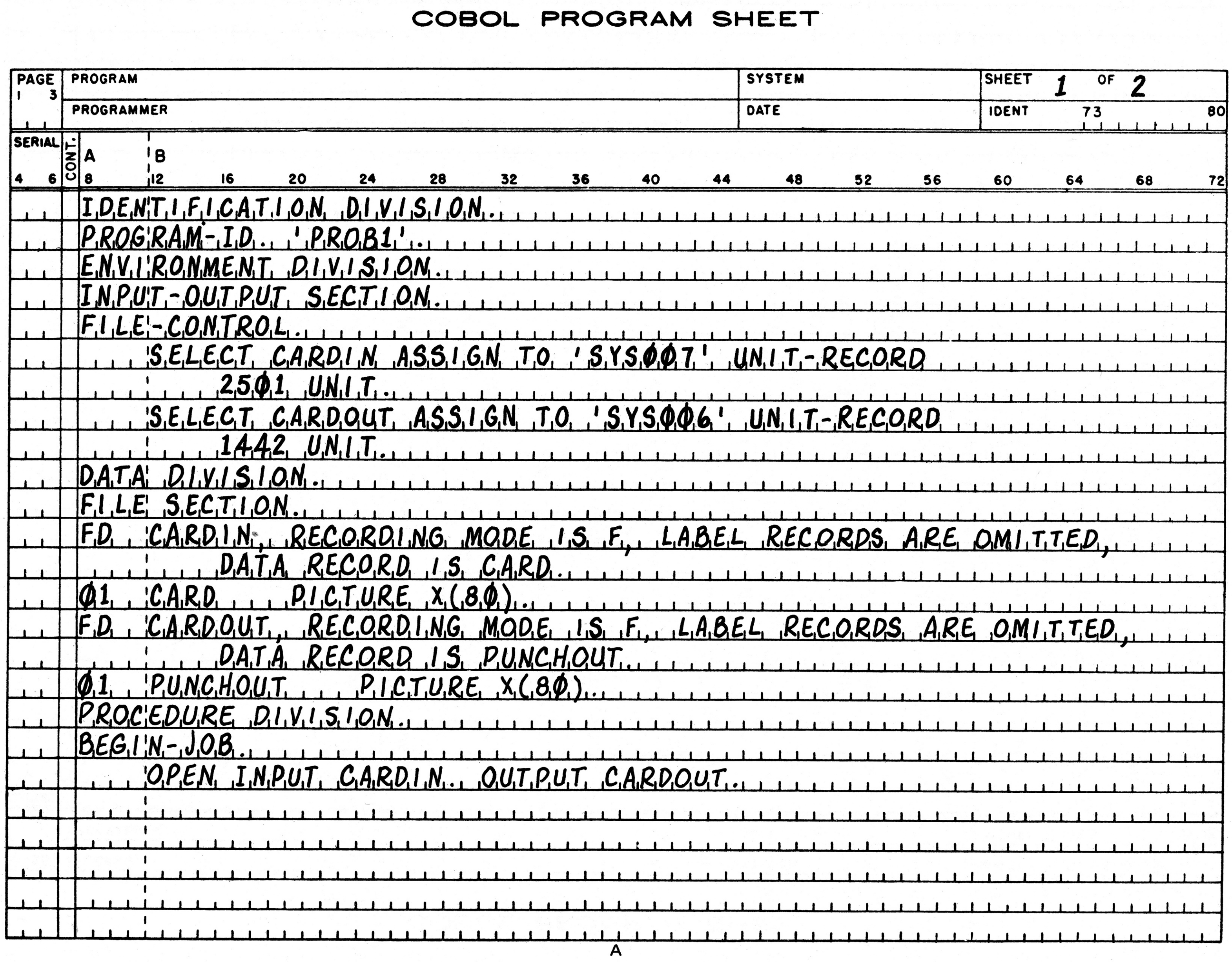

COBOL PROGRAM SHEET
PAGE
1 3
PROGRAM
PROGRAMMER
SYSTEM
DATE
SHEET
OF
IDENT
73
80
SERIAL
CONT.
A
B
4
6
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72

Fig. 7–15 COBOL coding sheet.



COBOL PROGRAM SHEET

PAGE 1 3	PROGRAM	SYSTEM	SHEET 1 OF 2
	PROGRAMMER	DATE	IDENT 73 80

SERIAL 4 6 · CONT. · A 8 · B 12 · 16 · 20 · 24 · 28 · 32 · 36 · 40 · 44 · 48 · 52 · 56 · 60 · 64 · 68 · 72

```
IDENTIFICATION DIVISION.
PROGRAM-ID. 'PROB1'.
ENVIRONMENT DIVISION.
INPUT-OUTPUT SECTION.
FILE-CONTROL.
    SELECT CARDIN ASSIGN TO 'SYS007' UNIT-RECORD
        2501 UNIT.
    SELECT CARDOUT ASSIGN TO 'SYS006' UNIT-RECORD
        1442 UNIT.
DATA DIVISION.
FILE SECTION.
FD  CARDIN, RECORDING MODE IS F, LABEL RECORDS ARE OMITTED,
        DATA RECORD IS CARD.
01  CARD     PICTURE X(80).
FD  CARDOUT, RECORDING MODE IS F, LABEL RECORDS ARE OMITTED,
        DATA RECORD IS PUNCHOUT.
01  PUNCHOUT    PICTURE X(80).
PROCEDURE DIVISION.
BEGIN-JOB.
    OPEN INPUT CARDIN. OUTPUT CARDOUT.
```

A

Fig. 7–16A, two-page COBOL program.

COBOL PROGRAM SHEET

PAGE 1 3

PROGRAM

PROGRAMMER

SYSTEM

DATE

SHEET 2 OF 2

IDENT 73 80

SERIAL 4 6 | CONT. | A 8 | B 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72

```
READ-CARD.
    READ CARDIN. AT END GO TO END-OF-JOB.
    WRITE PUNCHOUT FROM CARD.
    GO TO READ-CARD.
END-OF-JOB.
    CLOSE CARDIN, CARDOUT.
    STOP RUN.
```

A (cont'd)

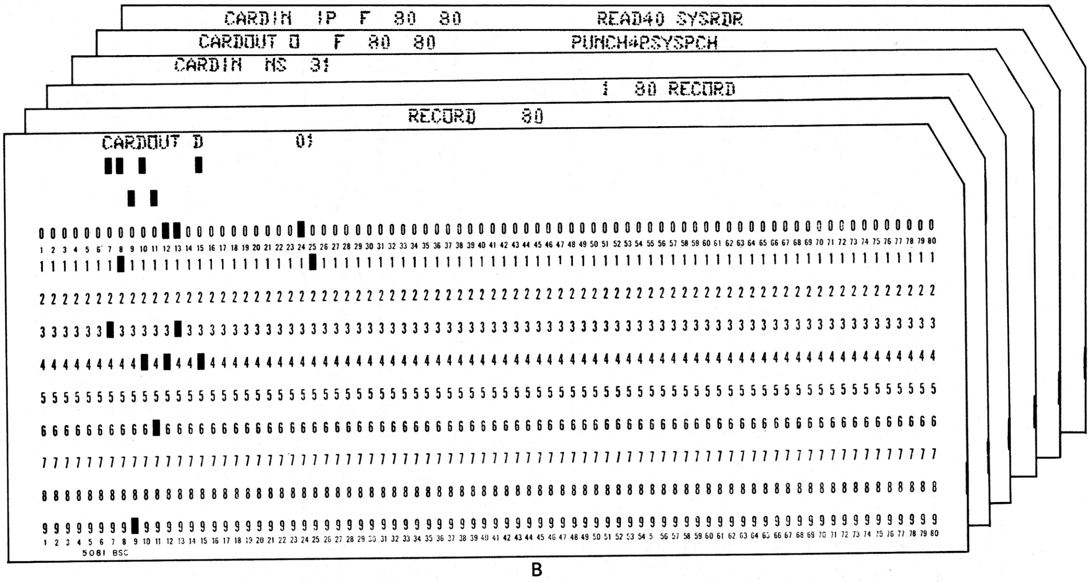

CARDIN IP F 80 80 READ40 SYSRDR
CARDOUT O F 80 80 PUNCH4PSYSPCH
CARDIN NS 31
1 80 RECORD
RECORD 80
CARDOUT D 01
5081 BSC
B

Fig. 7–16B, cards.

LABORATORY ASSIGNMENTS

1. Punch the cards that are illustrated in Fig. 7–9 from the SPS computer program.
2. Punch the cards that are illustrated in Fig. 7–12 from the FORTRAN program.
3. Punch the cards that are illustrated in Fig. 7–14 from the RPG program.
4. Punch the cards that are illustrated in Fig. 7–16 from the COBOL program.
5. Turn to the Appendix and do the punching assignments indicated by your instructor.

REVIEW QUESTIONS

1. What is a program?
2. Name five types of programming languages.
3. Are program cards used in punching computer programs?

QUESTION CARDS

Figures 7–17 through 7–20 contain questions that are to be interpreted. Write the question and the answer to the question on a separate sheet of paper.

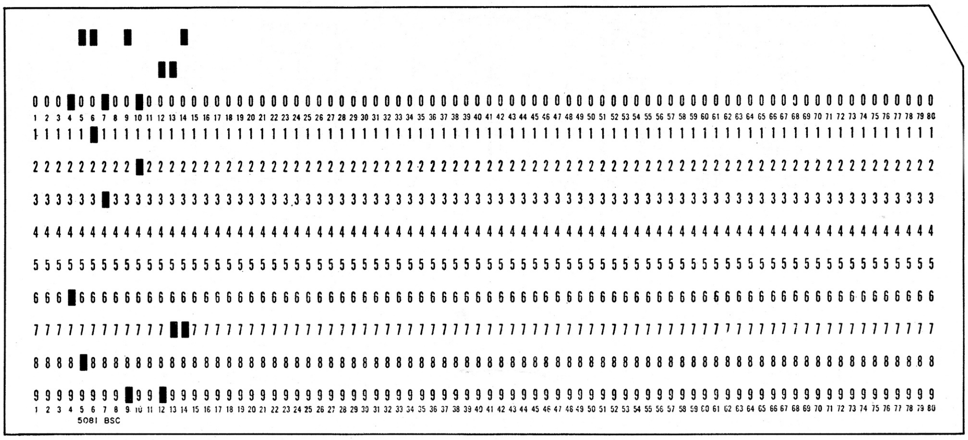


Fig. 7–17

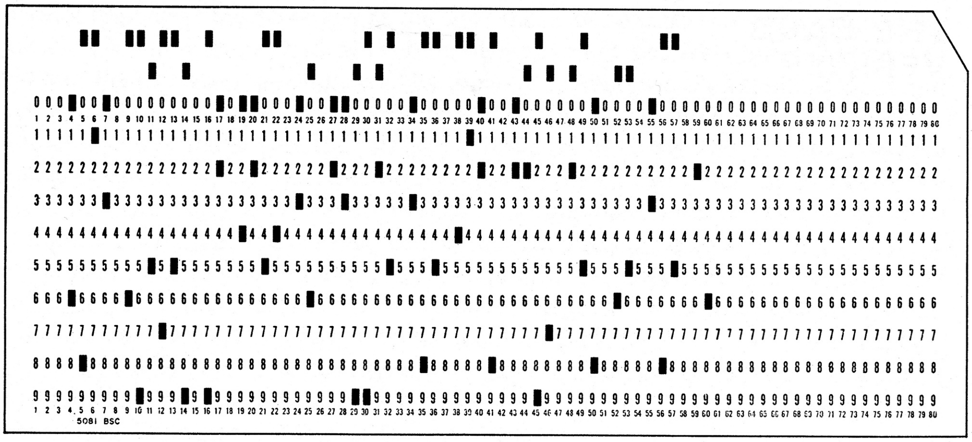


Fig. 7–18

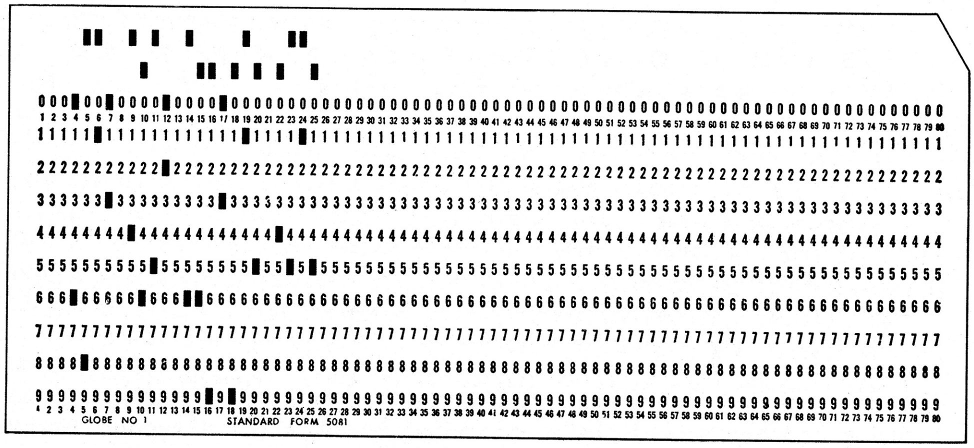

GLOBE NO 1
STANDARD FORM 5081

Fig. 7–19

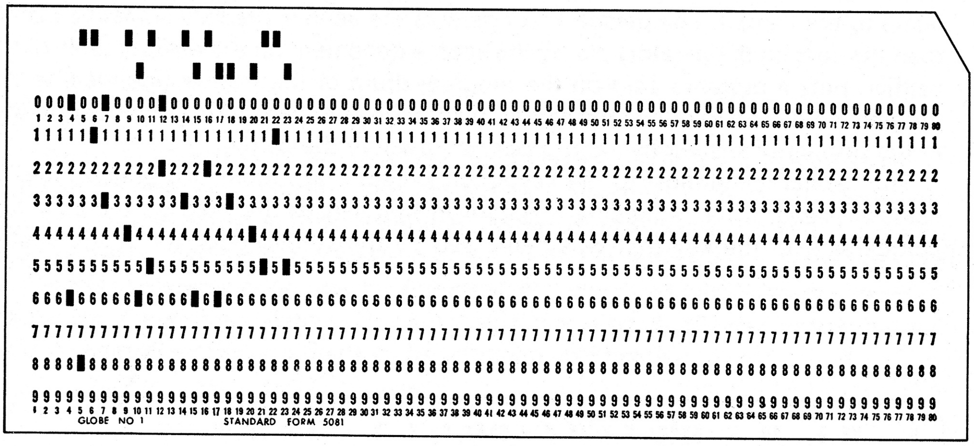

GLOBE NO 1
STANDARD FORM 5081

Fig. 7–20

chapter 8 THE CARD VERIFIER

In most cases the keypunch operator is aware of a mistake the moment the wrong key is depressed. To correct the error, the card must be duplicated to the card column in error, the right key depressed, and the rest of the card punched. However, there are times when an error goes undetected. Unless these errors are found and corrected, the reports that are to be obtained from these cards will also be inaccurate. This operation, in which the cards are checked for accuracy of punching, is called verifying, and the machine is called the verifier. Usually after the keypunch operator has punched the cards, the cards and the accompanying source document are taken to the verifier. The person that operates the verifier (usually somebody other than the keypunch operator) places the source document on the reading table of the verifier, puts a program card on the program drum of the verifier (identical to the program card used to punch the cards), places the punched cards (still in sequence) in the hopper of the verifier, and proceeds to verify the cards.

The verifier is identical to the keypunch except that it does not punch holes in cards; instead, it has a reading mechanism that senses the hole on the card and compares it to the key that was depressed by the verifier operator. If the verifier

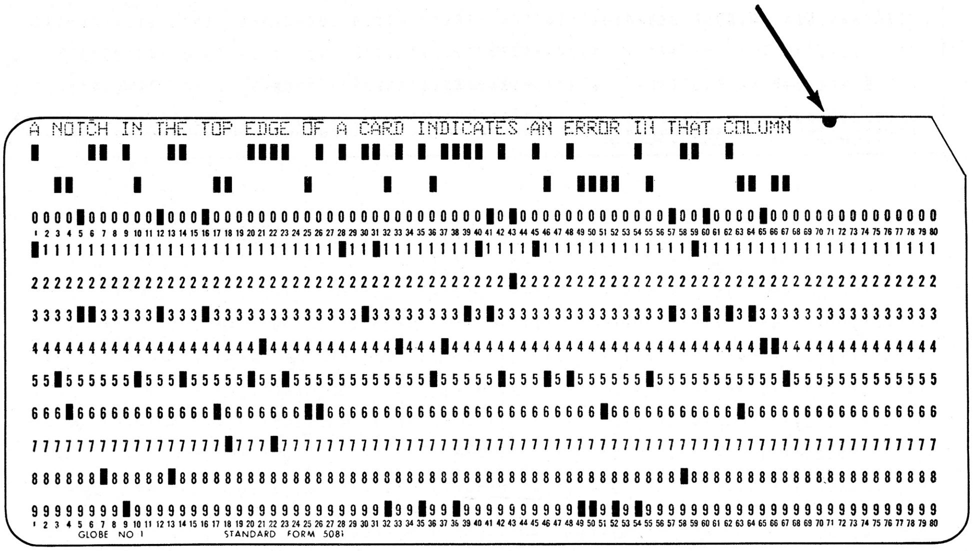

A NOTCH IN THE TOP EDGE OF A CARD INDICATES AN ERROR IN THAT COLUMN
GLOBE NO 1
STANDARD FORM 5081

Fig. 8–1 Error notch.

operator depresses the same key as the hole that was sensed, the verifier allows the next card column to be read. If there is disagreement between the punch on the card and the key that was depressed by the verifier operator, the keyboard locks and a red light goes on, signaling an error in verification. The verifier operator is allowed three chances to make sure the mistake is not hers. If at the end of three attempts there is still no agreement between the punch on the card and the key depressed by the verifier operator, the 12 edge of the card is automatically notched above the card column that is in error and the next card column is ready to be verified (Fig. 8–1). If a card is found to contain no errors in verification, it is assumed to be correct. The verifier places a small notch on the column-80 edge of the card, signifying that the card has been verified and found to be accurate (Fig. 8–2). All cards that contain errors are usually given back to the original keypunch operator to be corrected. It is important to note that errors must be kept to a minimum, because time spent in correcting is time that can be put to better use.

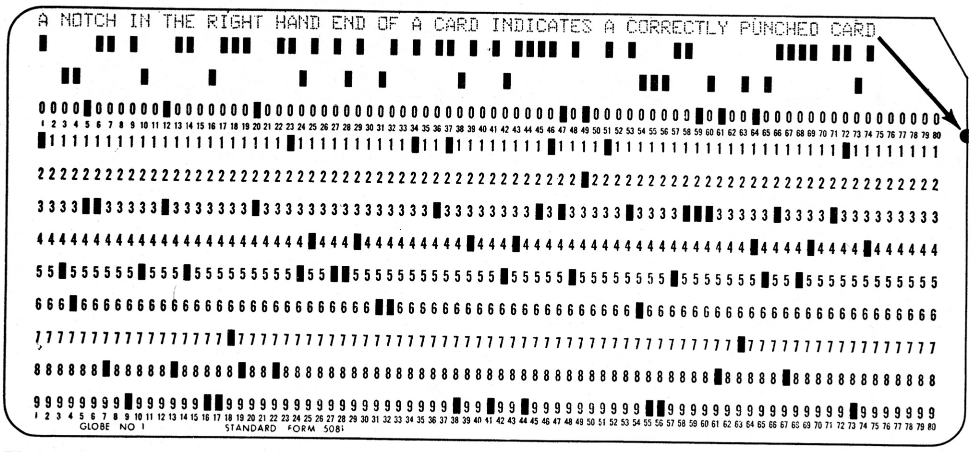

A NOTCH IN THE RIGHT HAND END OF A CARD INDICATES A CORRECTLY PUNCHED CARD
GLOBE NO 1
STANDARD FORM 5081

Fig. 8–2 Correct notch.

THE 56 VERIFIER

The IBM 56 Verifier (Fig. 8–3) resembles the 26 keypunch in design and operation. Program control, card feeding, and stacking are identical in both machines. Although program cards are interchangeable between machines, the zero code will start automatic verification (instead of duplication); in other words, fields from the card at the verifying station may be automatically compared with the same fields of the card at the reading station. Usually, fields that were duplicated in the original keypunching operation are fields to be automatically verified.

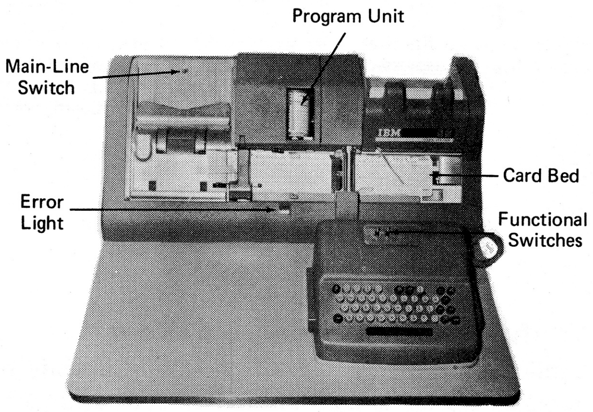
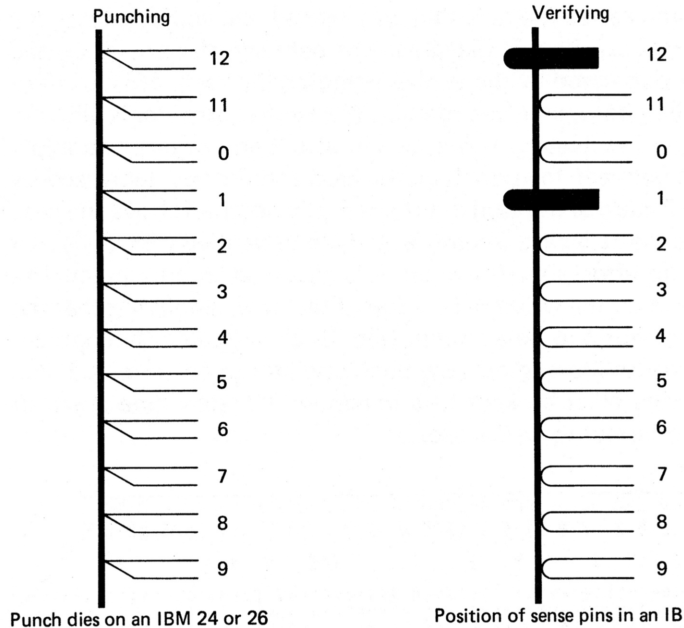
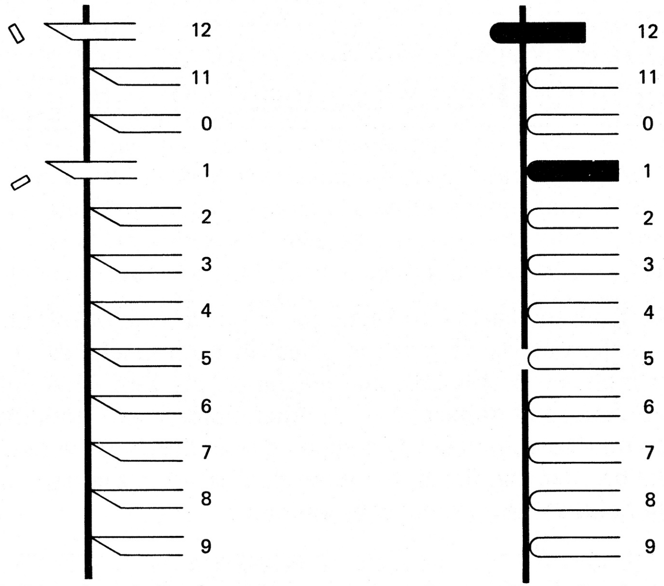


Fig. 8–3 IBM 56 verifier.



Punch dies on an IBM 24 or 26 Card Punch.

Position of sense pins in an IBM 56 Verifier after depressing the A key. The card advances to the next column.



Position of punch dies after letter A has been depressed.

Position of sense pins when an A key is depressed and the wrong character was punched. The error light comes on and the keyboard locks up.

Fig. 8–4 Sensing pins.

Verifying Station

Verification is performed at the station directly beneath the hopper. The verifier contains a sensing mechanism that consists of 12 pins instead of punch dies. See Fig. 8–4.

Error Light

Instead of a backspace key, the verifier is equipped with an error light (Fig. 8–5). When an error is detected, the error light goes on, and the keyboard locks.

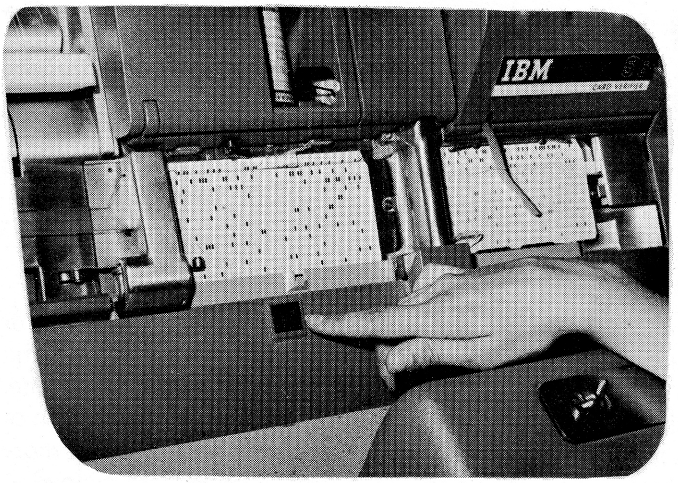


Fig. 8–5 Error light.

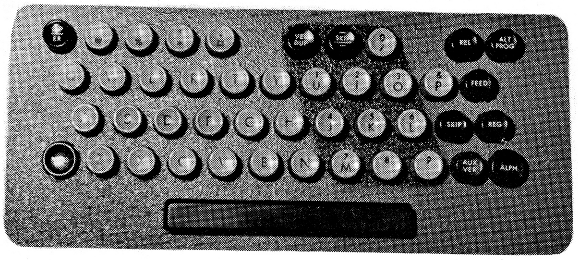


Fig. 8–6 Verifier keyboard.

Combination Keyboard

Figure 8–6 shows the combination keyboard on the 56 verifier. Only the following keys differ in operation from the keys found on the keypunch.

VER DUP (verify duplication). The VER DUP key causes verification of the card at the verifying station by comparing it to the card at the reading station. With program control, a single depression of this key causes verification of the field at the rate of 20 columns per second. Without program control, verification is performed at the rate of 10 columns per second for as long as the key is depressed.

AUX VER (auxiliary verify). The AUX VER key functions only if the verifier is equipped with the optional auxiliary verification feature. When depressed, this key causes verification by comparing the card at the verifying station with a master card mounted on an auxiliary program drum.

MP–ER (multiple punch and error release). The MP–ER key serves two functions. It prevents normal spacing of the card in order to verify two or more punches in one column for the verification of special characters and code punches not found on any of the regular keys. Another function of the MP–ER key is to release the keyboard when the keyboard becomes locked during a verifying operation. The keyboard is in numeric shift when this key is depressed.

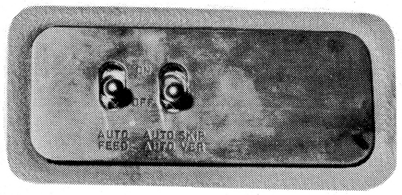


Fig. 8–7 Functional switches.

Functional Control Switches

In Fig. 8–7 it should be noted that the automatic skip and verify switch replaces the auto skip dup switch of the keypunch. There is no print switch on the verifier.

Automatic Feed Switch

The automatic feed switch performs the same functions as the automatic feed switch on the keypunch with one exception. Feeding is suppressed when an error card moves from the verifying station. This allows the error card to stop between the verifying station and the reading station so that the correct information can be written on the card.

Automatic Skip and Automatic Verify Switch

When the automatic skip and verify switch is turned on, codes punched in the program card to control automatic skipping and verification are effective.

Operating the 56 Verifier

The procedure for operating the 56 verifier is much the same as the procedure for operating the 26 keypunch. The only exception is the error routine. The depressing of a wrong key can occur on the verifier just as easily as on the keypunch. Therefore, provision was made for the verifier operator to have three trials in the verification of a card column. If an error is made while verifying, the verifier operator has two more chances to depress the correct key. When the error light goes on, the following routine should be used:

1. Depress the error release key to free the keyboard.
2. Make a second attempt to verify the column. If the correct key is depressed, the error light goes out and verification of the next column can take place. If on this try there is still disagreement between the hole on the card and the key that was depressed by the verifier operator, the keyboard again becomes locked.
3. Depress the error release key again.
4. Make a third attempt to verify the column. At this time the light goes off and verification can be continued in the next column whether the card is correct or not. If it is incorrect, the column is indicated as such by the error notch. When it is evident that a character has been omitted, the skip key can be depressed instead of making the second or third attempt to verify the error column. The error column is then notched, the error light turns off, and the remaining portion of the field is skipped.

If it should be necessary to verify a card column that would contain multiple punching, the multiple punch-error key must be held down while each digit key is depressed. All punches in the card column must be verified.

Notching of the Card

A notch is cut in the right end of the card if it has been verified as one that contains no errors. Every field of the card must be either verified or programmed to skip in order for the final OK notch to be cut. If at any time the card is released by depressing the REL key, the card is not notched. Sometimes alphabetic fields are not verified because of the additional time required to do so. In these cases the alphabetic fields would be programmed to automatically be skipped during card verification and the OK notch would be placed on the card if all other fields were found to be accurate. If a card is to be verified without program control, each column must be keyed, spaced, or automatically verified for the OK notch to be placed on the card.

After cards have been verified, the incorrect cards are removed from the OK notched cards and given back to the keypunch operator. It should be noted that any card having a right-hand corner cut should not be used for a program card on the verifier, because the corner cut sometimes interferes with the OK notch-punching process.

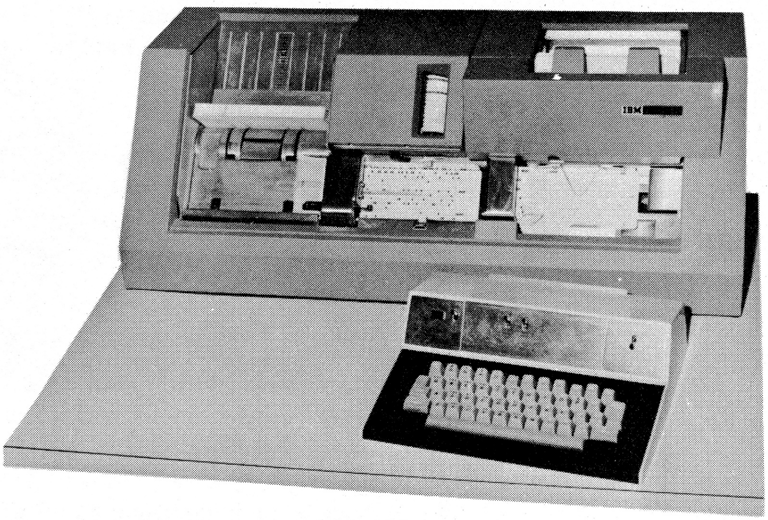


Fig. 8–8 IBM 59 verifier.

THE 59 VERIFIER

The IBM 59 verifier (Fig. 8–8) resembles the 29 keypunch in design and operation. Program control, card feeding, and stacking are identical in both machines. Although program cards are interchangeable between machines, the zero code will start automatic verification (instead of duplication); usually, fields that were duplicated in the original keypunching operation are fields to be automatically verified.

Verifying Station

Verification is performed at the station directly beneath the hopper. If the verifier operator depresses the same key the keypunch operator depressed in the original keypunching operation, the card will proceed to the next column to be verified. If the verifier operator does not depress the same key as the keypunch operator, an error is signaled by the error light. When a card is verified and found to be correct, a notch is automatically cut into the right end of the card. If the card is incorrect, a notch is cut over the column containing the error.

Error Light

The verifier is equipped with an error light that turns on when an error is detected. The keyboard also locks so that no other columns can be verified until the one in question is found to contain an actual punching error or it is found that the verifier operator happened to depress the wrong key.

Combination Keyboard

Figure 8–9 shows the combination keyboard on the 59 verifier. Only the following keys differ in operation from the keys found on the 29 keypunch.

VER DUP (verify duplication). The VER DUP key causes verification of the card at the verifying station by comparing it to the card at the reading station. With program control, a single depression of this key causes verification of a field at the rate of 50 columns per second. Without program control, verification is performed at the rate of 50 columns per second for as long as the key is depressed.

NOTCH (cutting the error notch). When depressed, the NOTCH key causes a small half-circle notch to be cut above the card column in error. This key is used

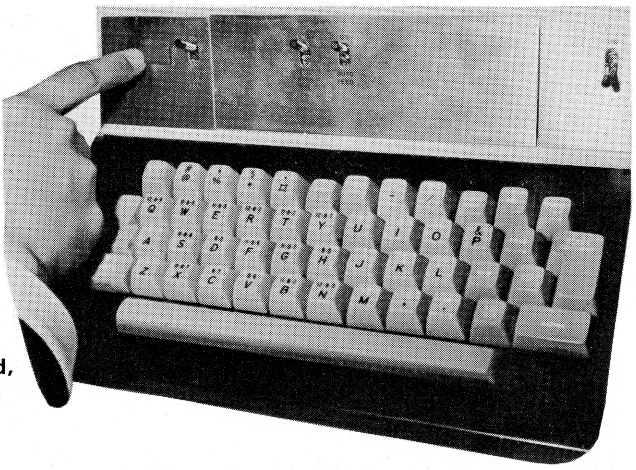


Fig. 8–9 Combination keyboard, functional switches, error light.

only during a high-speed autoverification operation or during verification of a field programmed for left-zero insertion. It will not notch the card under any other conditions.

AUX VER (auxiliary verify). The AUX VER key functions only if the verifier is equipped with the optional auxiliary verification feature. When depressed, this key causes verification by comparing the card at the verifying station with a master card mounted on an auxiliary program drum.

BLANK-COLUMNS/LEFT-ZERO CTRL. Before October 1966, left-zero control was not included as part of automatic left-zero verification; these machines do not have the words Left-Zero Ctrl engraved on the key. The functions of this key are as follows:

1. BLANK COLUMNS. When this key is depressed, blank or unpunched columns are automatically verified. With program control, a single depression is sufficient to verify an entire field of blank columns. Without program control, the key must be held down for each blank column.
2. LEFT-ZERO CONTROL. This key is depressed at the completion of a field programmed for left-zero insertion and automatically verifies preceding or left zeros.

Functional Control Switches

It should be noted that the automatic skip and verify switch replaces the auto skip dup switch of the keypunch. There is no print switch on the verifier.

The automatic feed switch performs the same functions as the automatic feed switch on the 29 keypunch with one exception. Feeding is suppressed when an error card moves from the verifying station. This allows the error card to stop between the verifying station and the reading station so that the correct information can be written on the card.

The program selection switch determines whether program control starts in program one or program two. The program level may be changed during verification by using the program selection keys on the keyboard. Each time a new card is registered for verifying, however, the switch setting determines program level.

Operating the 59 Verifier

The procedure for operating the 59 verifier is much the same as the procedure for operating the 29 keypunch. The one exception is the error routine. The depressing of a wrong key can occur on the verifier just as easily as on the keypunch. Provision was made for the verifier operator to have three trials in the verification of a card column. If an error is made while verifying, the verifier operator has two more chances to depress the correct key. When the error light goes on, the following routine should be used:

1. Depress the error release key to free the keyboard.
2. Make a second attempt to verify the column. If the verifier operator depressed the correct key, the error light goes out and verification of the next column is allowed. If on this try there is still disagreement between the hole on the card and the key that was depressed by the verifier operator, the keyboard again becomes locked.
3. Depress the error release key again.
4. Make a third attempt to verify the column. This time the light goes off and verification can be continued in the next column whether the card is correct or not. If it is incorrect, the column is indicated as such by the error notch. When it is evident that a character has been omitted, the skip key can be depressed instead of making the second or third attempt to verify the error column. The error column is then notched, the error light turns off, and the remaining portion of the field is skipped.

If it should be necessary to verify a card column that would contain multiple punching, the multiple punch (MULT PCH) key must be held down while each digit key is depressed. All punches in the card column must be verified.

Using the Blank-Column/Left-Zero Key

When depressed without program control, blank-column/left-zero key functions as a blank-column verification key and verifies each blank column as long as the key is held down. With program control, verification of blank columns in a field takes place with a single depression of the key. This key has a different purpose than the skip key. The skip key verifies only the beginning column of a field as being blank. The blank-column key verifies all columns as being blank.

When a punch occurs in the blank-column verification procedure, the machine stops. If the stop is at the first column of a new field, verification may continue by depressing the correct digit or alphabetic key. If the stop is caused by a punch in the blank field, the operator may decide to use one of the two following methods:

1. Use the space bar for the three-try error procedure.
2. Use the skip key to skip the remainder of the field. If this method is used, an error notch is placed above the card column in error.

When left-zero insertion is programmed, depression of the blank-column/left-zero key allows the rest of the card to be processed, after the following:

1. Manual verification (the three-try error routine) of the units position of the field
2. Depressing the VER DUP key to verify duplication of a portion of or the units position of the field
3. Depressing the blank-column/left-zero key to verify through the units position of the field

It is not necessary to depress the left-zero key to allow the remainder of the card to be processed, after the following:

1. Using the skip key
2. An error resulting in an error notch in the units column of the field

Notching of the Card

A notch is cut in the right end of the card if it has been verified as one that contains no errors. Every field of the card must be either verified or programmed to skip in order for the final OK notch to be cut. If at any time the card is released by depressing the REL key, the card is not notched. Sometimes alphabetic fields are not verified because of the additional time required. In these cases the alphabetic fields would be programmed to automatically be skipped during card verification and the OK notch would be placed on the card if all other fields were found to be accurate. If a card is to be verified without program control, each column must be keyed, spaced, or automatically verified for the OK notch to be placed on the card.

After cards have been verified, the incorrect cards are removed from the OK notched cards and given back to the keypunch operator for correction.

LABORATORY ASSIGNMENTS

1. Examine the verifier that is available and identify its external parts as given in the text.
2. Make two example cards such as the alphabet punched in card columns 1 through 26, the digits 0 through 9 in card columns 30 through 39, and your name beginning in card column 41. On the second card deliberately make some keypunching errors. Use these two cards on the verifier in order to become familiar with its operation. Try to obtain a correct notch on the first card and error notches over the error columns on the second card.
3. Take cards from a previous keypunching assignment and verify them on the verifier.
4. Turn to the Appendix and do the punching assignments indicated by your instructor. Save these cards to be verified if a verifier is available.

REVIEW QUESTIONS

1. What is the purpose of the verifier?
2. How can a person tell if a card has been verified?
3. Describe the verification procedure for the 26 keypunch. The 29 keypunch.

QUESTION CARDS

Figures 8–10 through 8–13 contain questions that are to be interpreted. Write the question and the answer to the question on a separate sheet of paper.

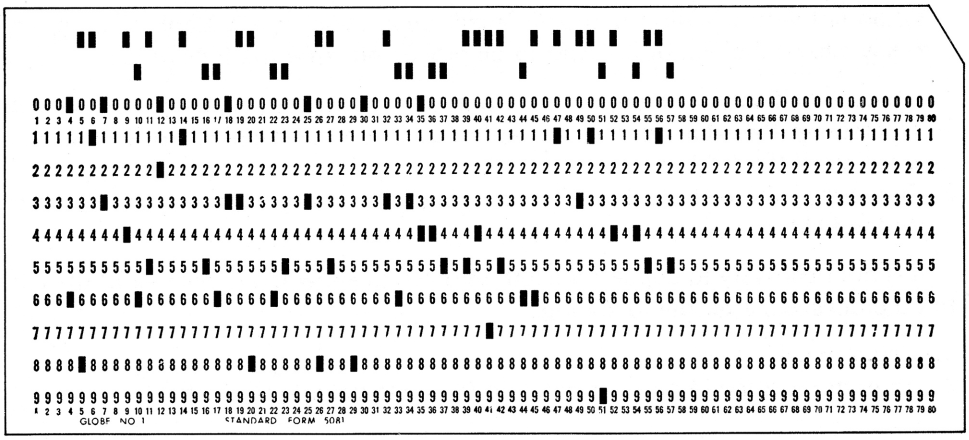


Fig. 8–10

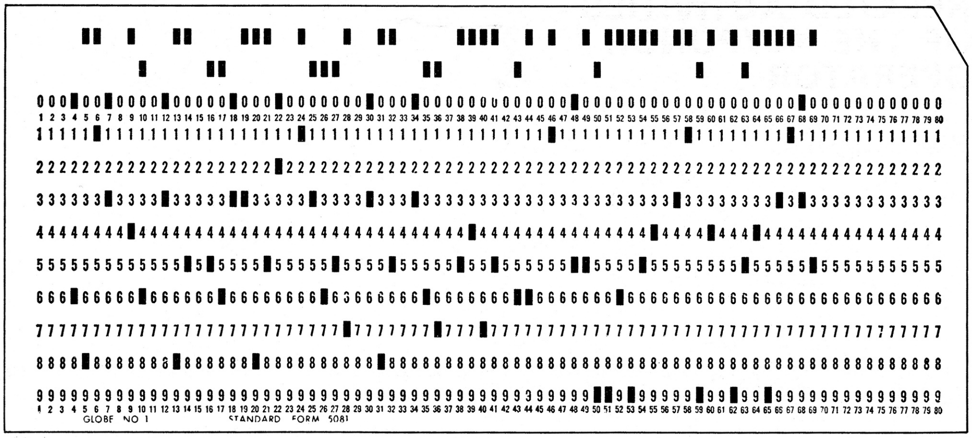

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Fig. 8–11

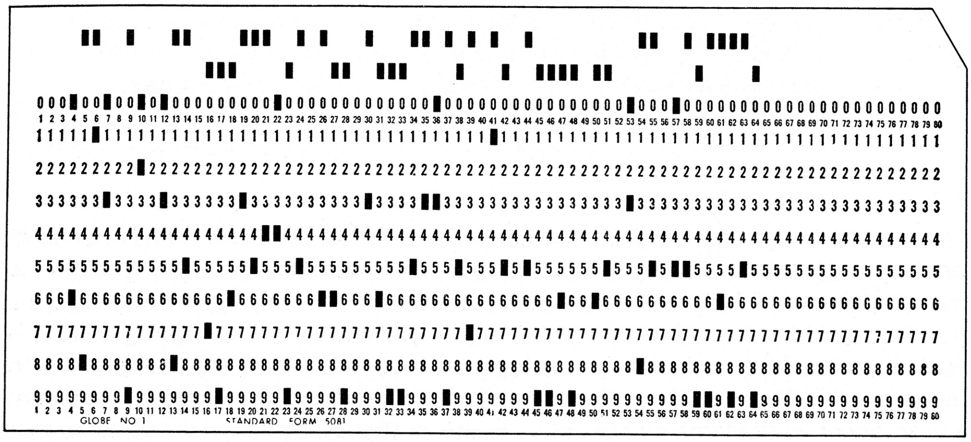
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Fig. 8–12

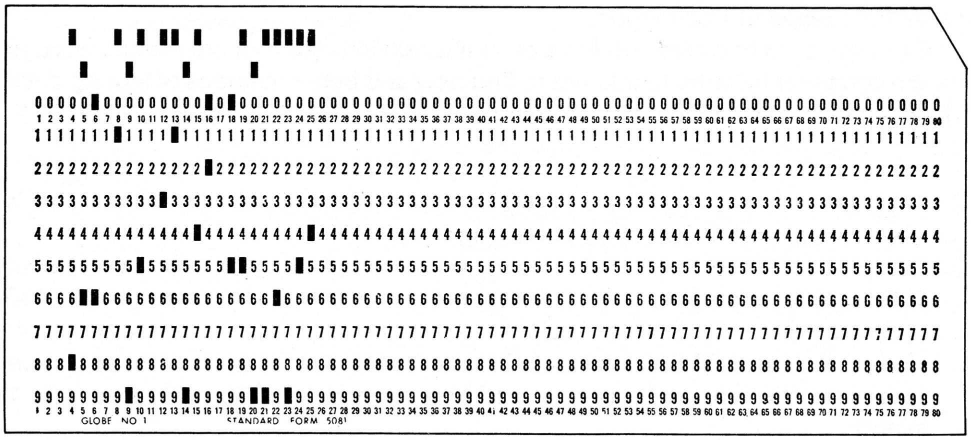
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Fig. 8–13

chapter 9 RELATED ACTIVITIES OF THE KEYPUNCH OPERATOR

The punched card and the punched card data processing machines have been in operation since the 1890 census. The card itself was comparatively unchanged from 1928 until 1965, when the rounded corner was introduced. Because the punched card has been proved to be a highly efficient means of storing data, it is likely that punched card data processing machines will be used for many years. In fact, since 1962 the use of punched cards has increased on the average of 11 percent a year, owing to the large number of computer systems installed. It is estimated that between 80 and 90 percent of the computer systems now in operation use punched cards for storage of information.

However, punched cards do have certain disadvantages that are serious enough for the computer industry to attempt to find new and better methods of storing data. The disadvantages include the following:

1. Any mistake on a card requires that an entirely new card be punched.
2. The punched card can store a maximum of only 80 units of information. This is often not enough information pertaining to an item.
3. Computers that use card-readers as input are slow, having a maximum speed of 400 to 800 cards per minute. A few computers can operate at speeds of 2,000 cards per minute. If all 80 card columns are punched with data, the computer can read and store 160,000 units of information in 1 minute. A computer that uses magnetic tape as input can read and store at least 6½ million units in 1 minute.
4. Punched cards take up room. Storage space becomes a problem in time.
5. Damaged or worn cards can cause card jams.

MOHAWK DATA-RECORDER

One of the newest methods of overcoming the disadvantages of the punched card was developed by the Mohawk Data Sciences Corporation. The machine, called the Mohawk 1101 Data-Recorder (Fig. 9–1), has a keyboard similar to the keyboard of a keypunch. The operator keys in the data, which is written on a strip of magnetic tape in the form of small magnetized spots. The machine also serves as a verifier, and verification can take place immediately if necessary. If a mistake is sensed in

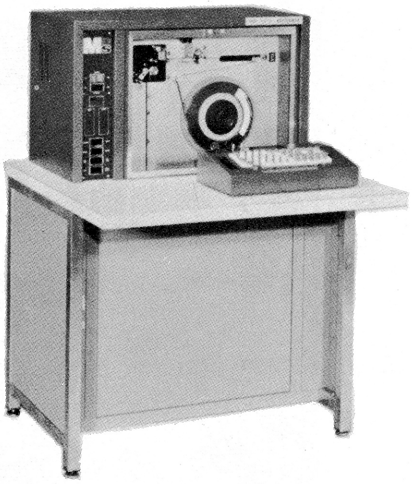

Fig. 9–1 Mohawk 1101 Data-Recorder.

verification, it can be corrected at that time. Compare this to the keypunch mistake that is caught by the verifier in a separate operation and is then given back to the keypunch operator to punch a new card.

The 12-inch diameter reel of magnetic tape is 2,400 feet long and holds approximately the same amount of data as 36,000 cards. Another advantage is that the tape can be reused. After the data that were stored on it are no longer needed, the old data can be erased and new data recorded in much the same manner as on a modern home tape-recorder.

Briefly, the entire operation would be as follows:

Recording the Data on Magnetic Tape

1. The operator keys the data into the data-recorder, and the data enter a *memory* unit. If the operator senses an error at this time, it is corrected by backspacing and rekeying the correct data.
2. When all the data pertaining to a unit or topic are entered, the operator causes it to be written on the magnetic tape.
3. The data-recorder automatically backspaces the tape after data are recorded on it and compares the data to the contents of the memory unit, checking that the data were written correctly.

Verifying the Data

1. Data from the tape are read into the memory unit of the data-recorder by the operator.
2. The operator keys in the data as the source document is read. Each character that the operator keys is compared to the data in the memory unit. If the data are the same, the verification process continues.
3. If the data are not the same, the operator determines the correct character and touches the error reset key. The operator then keys the correct character into the memory unit.
4. The corrected data just written on tape are then read and compared automatically with the data stored in the memory unit.

HONEYWELL KEYTAPE DEVICE

Another machine, the Honeywell Keytape, developed by Honeywell Inc. (Fig. 9–2), functions in much the same manner as the data-recorder. The basic difference is that the keytape winds the tape from reel to reel and the data-recorder deposits the tape into a bin after data are written and then winds it onto a drum.

Companies that have changed their mode of computer input from cards to magnetic tape have found that there are few difficulties in training keypunch operators to be data-recorder operators or keytape operators. Both machines are quite similar to the keypunch and are only slightly more complex.

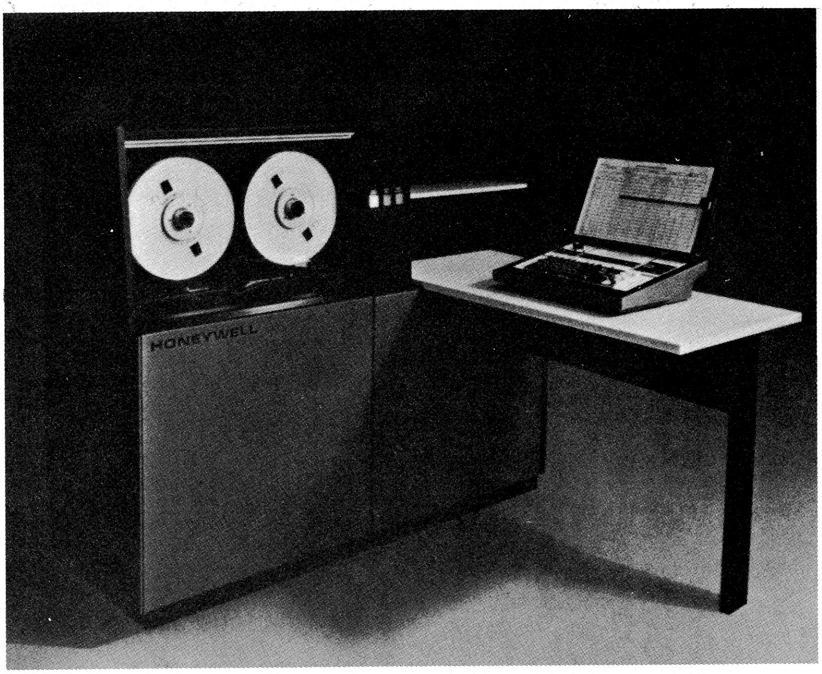

Fig. 9–2 Honeywell Keytape Device.

IBM MAGNETIC DATA INSCRIBER

One of the newest machines that also places the data on magnetic tape instead of on cards is the IBM 50 Magnetic Data Inscriber (Fig. 9–3). The keyboard on the 50 data inscriber is similar to the keyboard of the 29 keypunch. The 50 data inscriber is different from the data-recorder or the keytape in that each tape is housed in a compact, self-contained tape cartridge. Each cartridge has a data capacity of 23,000 characters. It is not necessary to thread the tape into the machine, nor is any special handling required by the operator. The length of the tape is approximately 100 feet.

To load a tape, the operator simply inserts a cartridge into the machine and selects the proper operating mode—writing, reading, or verifying. The tape is automatically threaded through the tape path and prepared for processing. An indicator light labeled OPERATE goes on when the tape is loaded, indicating that the machine is ready for operation. While data are being entered, the magnetic tape moves in synchronization with the program unit in much the same manner as the program

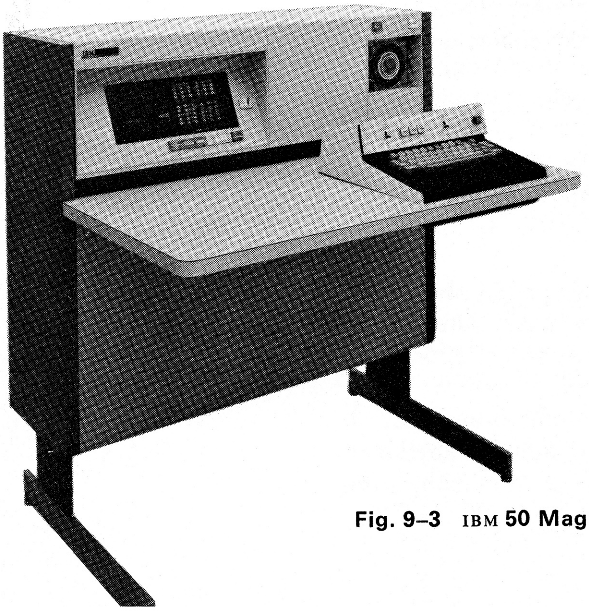

Fig. 9–3 IBM 50 Magnetic Data Inscriber.

unit and the card movement on the 26 keypunch. After a tape has been completed it is rewound in approximately 45 seconds.

FUTURE PROSPECTS

All keypunch operators should be aware that in the future there is a distinct possibility they will be required to transfer their keypunching talents to one of the magnetic recording methods. However, the keypunch operator should also note that somehow data will still have to be recorded and that therefore someone will be required to put the data into the form a computer understands. Even though some extra training may be required to develop the new skills, it appears that jobs will always be available for qualified keypunch operators.

REVIEW QUESTIONS

1. What are some of the disadvantages of punched cards?
2. What can be used to store data besides punched cards?
3. What machines are used to store data other than keypunches and how do they compare with each other?

LABORATORY ASSIGNMENT

1. Turn to the Appendix and do the punching assignments indicated by your instructor.

RELATED ACTIVITIES

1. Discover if any of the businesses in your area that have keypunches also have magnetic tape recording devices. Do any of the businesses have the magnetic tape devices and no keypunches? Do any of the businesses plan to eliminate their keypunching activities completely and replace them with the magnetic tape units?

QUESTION CARDS

Figures 9–4 through 9–7 contain questions that are to be interpreted. Write the question and the answer to the question on a separate sheet of paper.

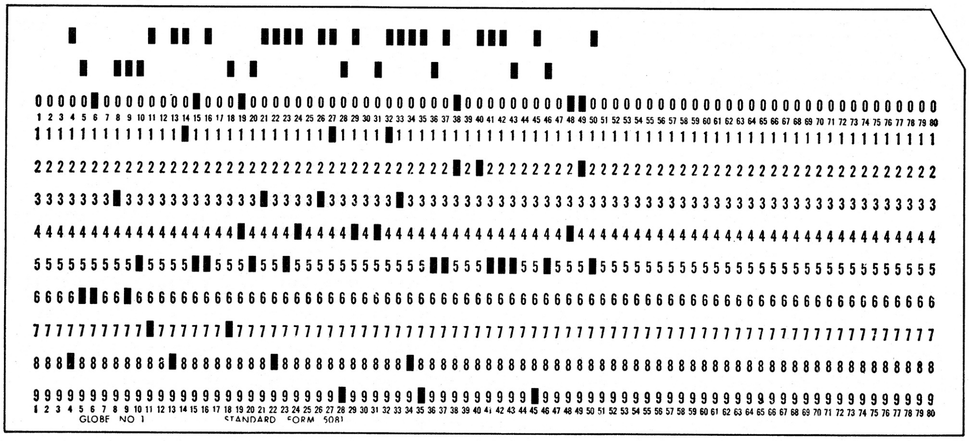

Fig. 9–4

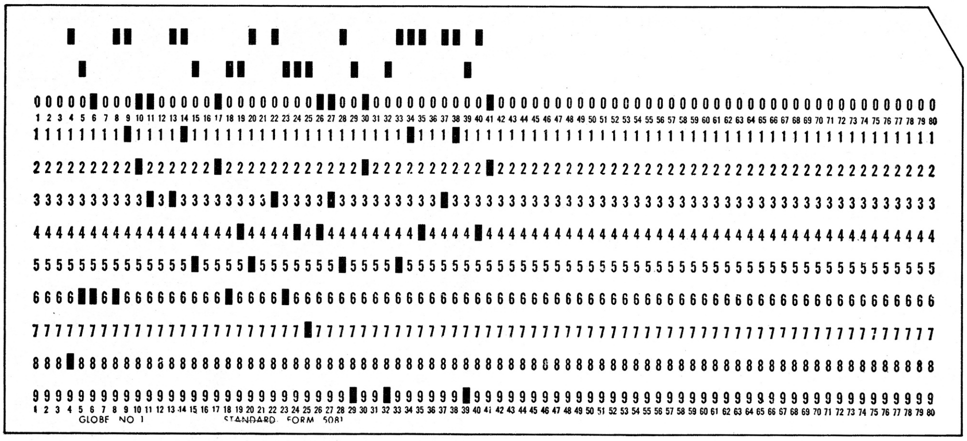
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Fig. 9–5

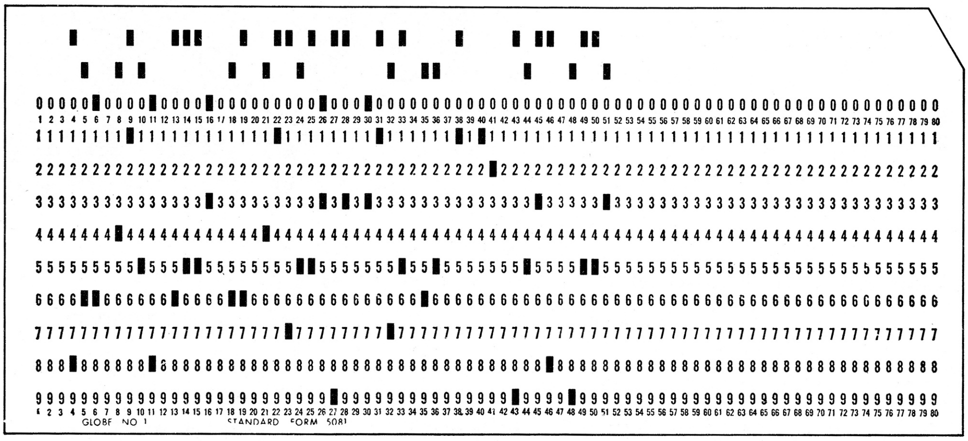
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Fig. 9–6

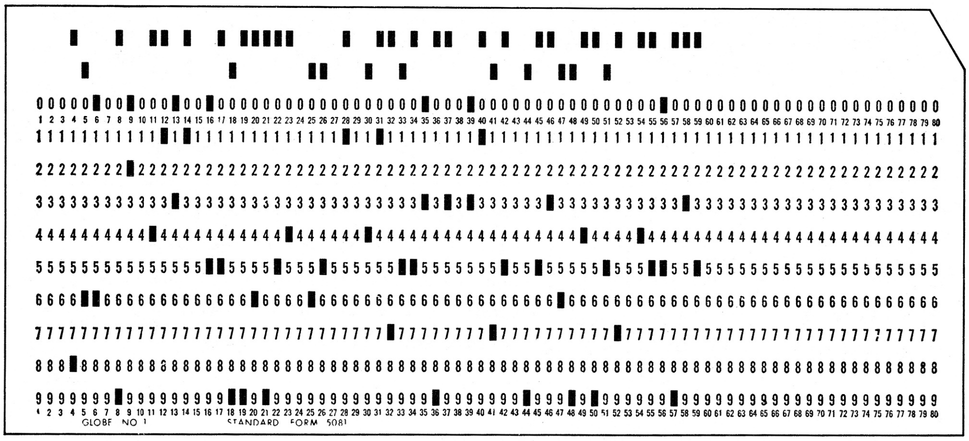
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Fig. 9–7

OPERATING THE SELECTRIC TYPEWRITER chapter 10

The IBM Selectric typewriter (Fig. 10–1) may be used to develop speed and accuracy in locating the numeric keys used on the 24, 26, and 29 keypunch machines. The Selectric typewriter features a small globe-shaped printing element (Fig. 10–2) containing the type characters instead of the usual type bars. Instead of the entire carriage moving, as on an ordinary typewriter, this printing element moves across the paper.

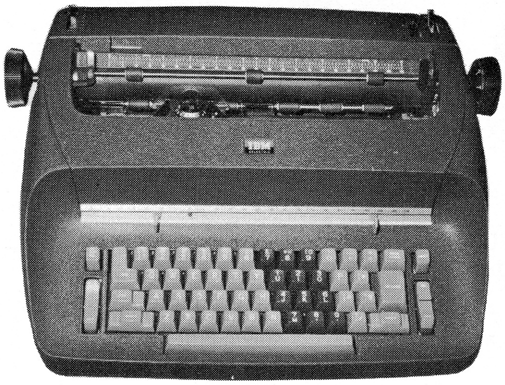

Fig. 10–1 IBM **Selectric typewriter.**

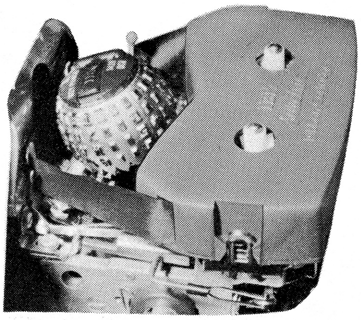

Fig. 10–2 Printing element.

OPERATING FEATURES OF THE SELECTRIC TYPEWRITER

Stationary Paper Carrier (Fig. 10–3)

1. *Right platen knob.* The right platen knob is used for fast paper insertion.
2. *Left platen knob.* The left platen knob is for variable line spacing. It is operated by pressing in against the center of the left platen knob, which allows the platen to be rotated freely in either direction.

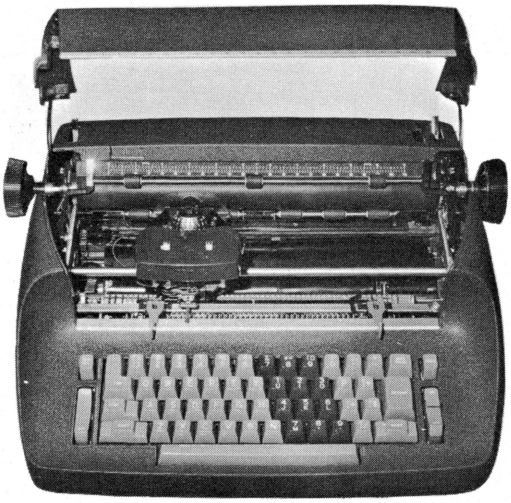

Fig. 10–3 Stationary paper carrier (top looking down).

3. *Paper release lever.* The paper release lever (Fig. 10–4) is used for paper insertion and removal. It should be moved forward away from the operator when positioning or removing the paper. While typing, the lever should be moved backward toward the operator.

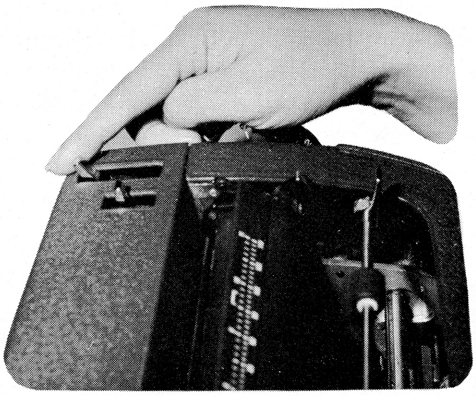

Fig. 10–4 Paper release lever.

4. *Line spacing lever.* The line spacing lever (Figs. 10–5 and 10–6) will cause single spacing when moved forward and double spacing when moved backward.

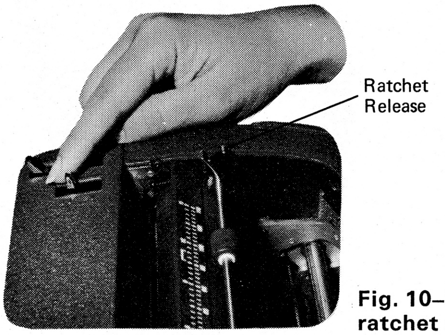
Ratchet Release

Fig. 10–5 Line spacing and ratchet release levers.

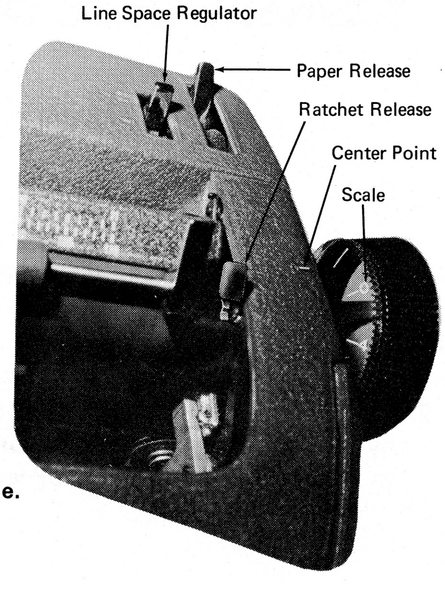
Line Space Regulator
Paper Release
Ratchet Release
Center Point
Scale

Fig. 10–6 Card depth gauge.

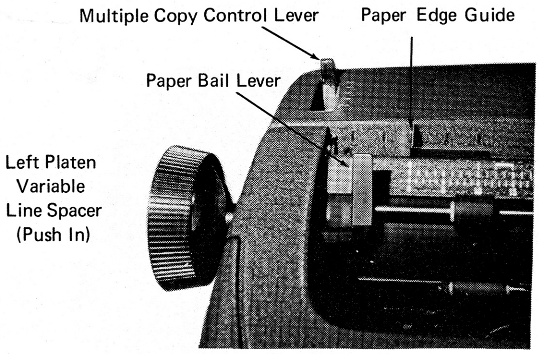
Multiple Copy Control Lever
Paper Edge Guide
Paper Bail Lever
Left Platen Variable Line Spacer (Push In)

Fig. 10–7 Multiple copy control lever, paper edge guide, paper bail, and paper bail lever.

5. *Multiple copy control lever.* When the multiple copy control lever (Fig. 10–7) is pushed forward to the position farthest from the operator, the machine is adjusted for single copy forms. As the weight of the paper increases or the number of carbon copies increases, the lever should be moved backward toward the operator one notch at a time.
6. *Paper edge guide.* Paper is positioned in the typewriter by the paper edge guide (Fig. 10–7). It is placed on the third mark for $8\frac{1}{2}$ by 11 paper.
7. *Paper bail and paper bail lever.* The paper bail lever (Fig. 10–7) on the paper bail is moved forward to insert paper and moved backward to hold paper against the platen.
8. *Clear view card holder.* The clear plastic holder allows the writing line to be seen. In addition, it holds cards and envelopes firmly against the platen. A black line in the center of the plastic indicates the vertical point at which the typing element will print on the paper. Horizontal lines help in locating the original typing line when a page is reinserted in the machine. See Fig. 10–8.

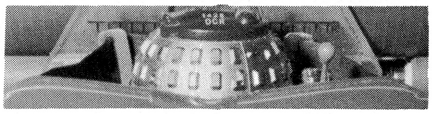

Fig. 10–8 Clear view card holder and aligning scale.

9. *Copy guide.* The copy guide (Fig. 10–9) prevents the refeeding of copies around the platen and provides a flat surface for erasing. The top scale on the copy guide is an inch scale, which allows for quick centering of the paper. The bottom scale can be used to determine the number of characters that have been typed per inch and also corresponds with the spacing on the visible margin scale.

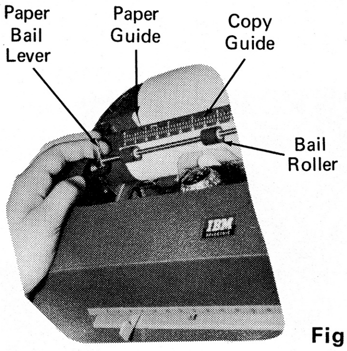

Fig. 10–9 Copy guide.

10. *Platen.* The platen is the roller that holds the paper and serves as a backing for the printing mechanism.

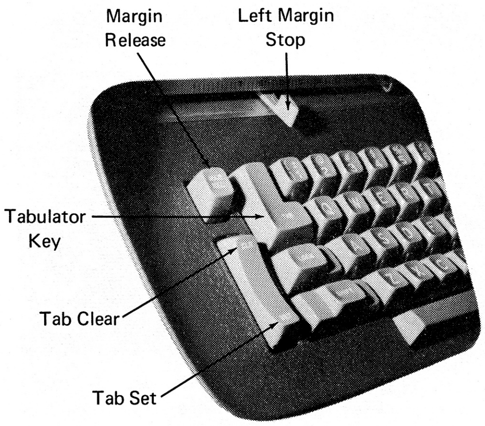

Fig. 10–10 Keyboard showing tab control, margin release, tab shift, shift lock, and multiple character keys.

Keyboard

1. CLR-SET. The clear-set lever is used for tab control (Fig. 10–10). To set a tab stop, the carrier is moved to the desired point on the writing line and then the SET end of the lever is pressed. To clear a tab, it is necessary to tab to the stop that is to be cleared and then to press the CLR end of the lever. To remove all tab stops, tab to the end of the writing line, hold down the CLR end of the lever, and depress the carrier return key.
2. MAR REL. The margin release key (Fig. 10–10) is used whenever it is necessary to write beyond the left or right margin. To write beyond the left margin, depress the MAR REL key and while holding it down, backspace through the margin. To write beyond the right margin, depress the MAR REL key before reaching the right margin and continue typing.
3. TAB. The TAB key (Fig. 10–10) is used to move the carrier to a tab stop.
4. SHIFT. The SHIFT key is depressed to place the typewriter into upper case.
5. LOCK. The shift lock is used to keep the typewriter in upper case and is released by depressing the shift key.
6. *Multiple character keys.* Two sets of special characters are printed on this key (Fig. 10–10). However, only one pair is found on a typing element. When elements are changed, the special characters on the element should be noted.
7. BACKSPACE. Depress the backspace key (Fig. 10–11) lightly to move the carriage backward one position. If held down, the carrier will move back continuously.
8. INDEX. The index key (Fig. 10–11) is used for vertical spacing. It is often used for quick paper insertion. If held down, it will move the paper upward continuously.

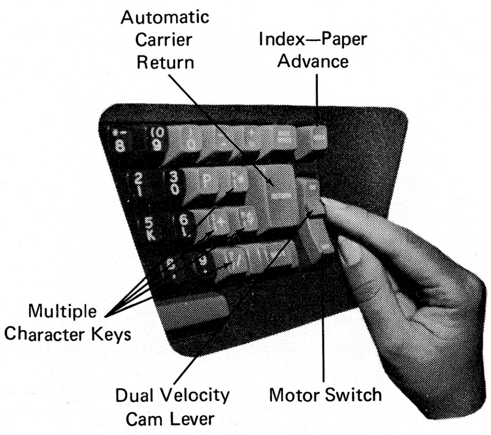

Fig. 10–11 Backspace, index return, and on-off keys and dual velocity cam lever.

9. RETURN. The return key (Fig. 10–11) is used to return the carrier to the left margin. It will also move the paper upward at the same time. To move the paper upward continuously, hold down this key.
10. ON/OFF. To activate the typewriter, depress the ON end of the key. To turn off the typewriter, depress the off end of the key (Fig. 10–11). The red area at the end of the base is seen when the machine is on and serves as a reminder to turn the typewriter off when work is completed.
11. *Dual velocity cam lever.* When using the Selectric as a typewriter, place the dual velocity cam lever in the on position. This lessens the possibility of cutting a hole in the paper. When the Selectric is used as a simulator, all keys strike with the same velocity and the lever should be off. Figure 10–11 shows the correct setting of the dual velocity cam lever when one wishes to deactivate the automatic feature of allowing certain keys to strike the paper at a slower velocity than the rest of the keys.
12. *Space bar.* The space bar is used to move the carrier one position horizontally. If held down, the carrier will move continuously.
13. *Underscore and hyphen.* When depressed, the underscore and hyphen key will type the character continuously.

Visible Margin Reset

1. *Margin scale.* The margin scale (Fig. 10–12) is used for setting margins and tabs.

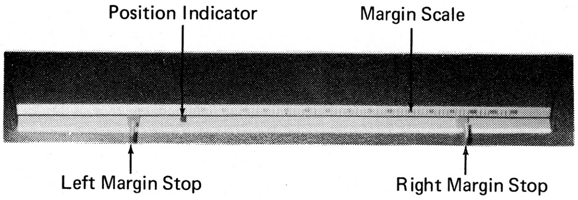

Fig. 10–12 Margin scale, left and right margin stops, and position indicator.

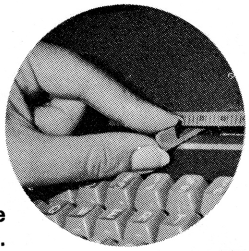

Fig. 10–13 Moving the margin stops.

2. *Left and right margin stops.* To set the left or right margin, press in the margin stop and slide it to the desired position on the margin scale (Fig. 10–13). When the stop is released, the carrier will return to the new margin location. Occasionally the typing position indicator must be moved by relocating the carrier because the stops will not slide past it.
3. *Position indicator.* The position indicator (Fig. 10–12) is a small red arrow that locates the exact typing position of the carrier on the visible margin scale.

Typing Element

The Selectric typewriter prints by means of the typing element (Fig. 10–14) instead of the usual typebar. The advantage of the Selectric typewriter is that the style of type can be changed to suit the particular job. There are interchangeable typing elements designed specifically for general correspondence, as well as for special typing applications. Merely by changing the typing element, the needs of a particular typing assignment can be met with a minimum of operator effort. The 1428 typing element has been especially designed to simulate 26 keypunch operations. By placing the 1428 element on a Selectric that has been modifed with the 10 contrasting colored key buttons for keypunch simulation, speed and accuracy can be developed without the actual keypunch machine. It is especially valuable if a keypunch is not available for each student.

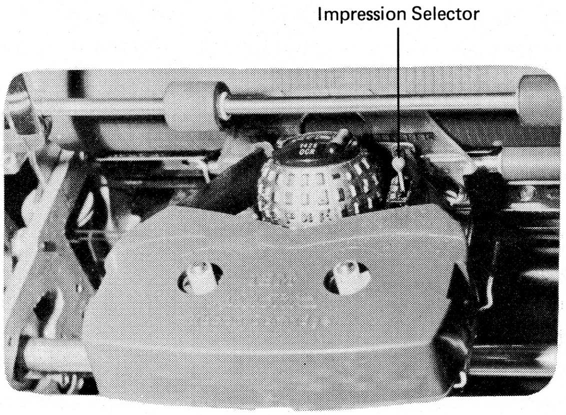

Fig. 10–14 Typing element and impression selector.

Impression Selector

The impression selector (Fig. 10–14) is used to adjust the striking force of the element to meet the requirements of different typing applications. To change settings, push the lever to the right and slide it either forward or backward to the desired setting. Do not force the lever against the position notches when changing setting.

Carrier

The carrier contains the typing element, the ribbon, and the ribbon control levers (Fig. 10–15).

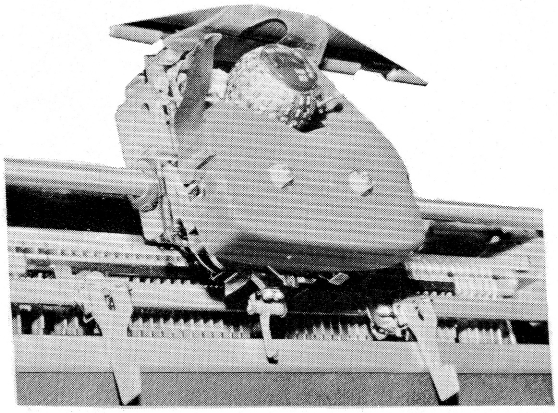

Fig. 10–15 Typing carrier and ball assembly.

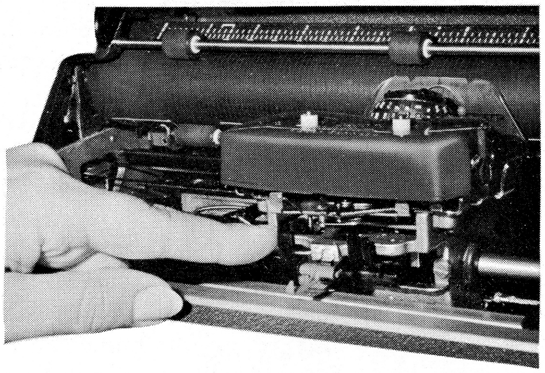

Fig. 10–16 Ribbon position lever.

Ribbon Position Lever

The ribbon position lever (Fig. 10–16) is used to change the lane of print on the ribbon. If a new lane is used daily, the old lane will re-ink itself. The setting found on the extreme right is used for stencil cutting. Settings 2, 3, and 4, to the left of the stencil setting, cause printing to occur on the top, middle, and bottom printing lanes, respectively.

Ribbon Reverse Lever

The ribbon reverse lever is used if it is necessary to manually reverse the ribbon for certain types of typing requirements. Merely move the lever in the direction opposite from the way it was positioned.

REMOVING THE RIBBON CARTRIDGE

1. Center the carrier.
2. Turn off the typewriter.
3. Place the paper bail against the platen.
4. Place the ribbon change lever to the right (Fig. 10–17). This raises the ribbon for easy removal from the ribbon lifts.

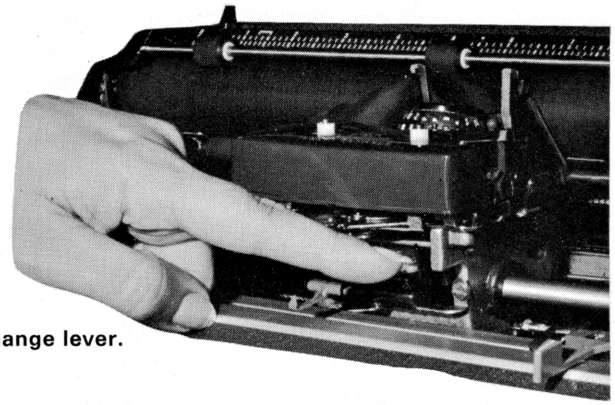

Fig. 10–17 Ribbon change lever.

5. Lift the cartridge straight upward off the ribbon cartridge spindle (Fig. 10–18).
6. Gently ease the ribbon from the slots in the ribbon lifts.
7. Rewind the excess ribbon by inserting a pencil in one of the top ribbon holes and turning it in the direction of the arrow.

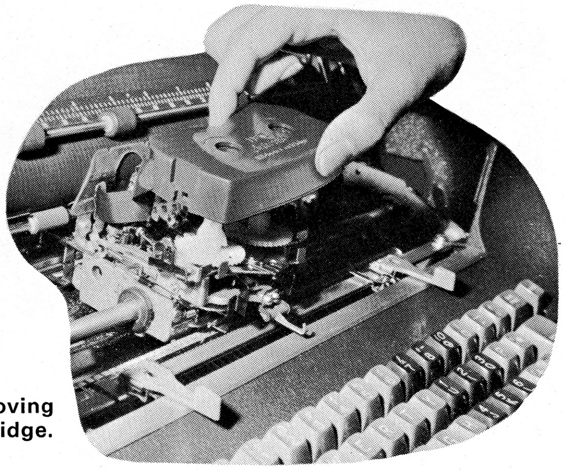

Fig. 10–18 Removing the ribbon cartridge.

REPLACING THE RIBBON CARTRIDGE

1. Be sure the carrier is centered, the machine off, the paper bail against the platen, and the cover opened.

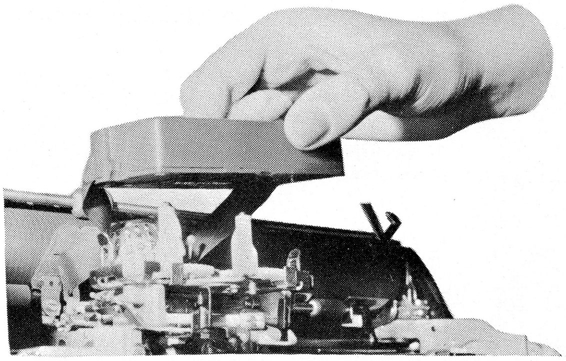

Fig. 10–19 Replacing the ribbon cartridge.

2. Place the ribbon change lever to the right.
3. Pull out a few inches of ribbon from the cartridge, and while holding the catridge in front of the ribbon lifts, slide the ribbon through the right ribbon lift.
4. Slide the ribbon down between the card holder and the typing element and through the left ribbon lift.
5. Place the cartridge on the two ribbon spindles (Fig. 10–19) and press down firmly and evenly until a click is heard.
6. Wind up the excess ribbon by turning either cartridge spindle in the direction indicated by an arrow on the case.
7. Place the ribbon change lever in its left position.

CHANGING THE TYPING ELEMENTS

As already mentioned, to use the Selective typewriter to simulate keypunch operation for numeric information, the special 1428 typing element must be placed on the typewriter. When removing or replacing the element (Fig. 10–20), the typewriter must be turned off and the machine placed in the lower-case position. Never force the element on or off of the element post.

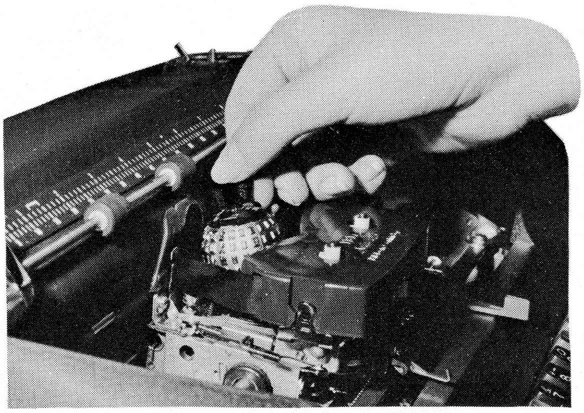

Fig. 10–20 Placing the 1428 element in the Selectric.

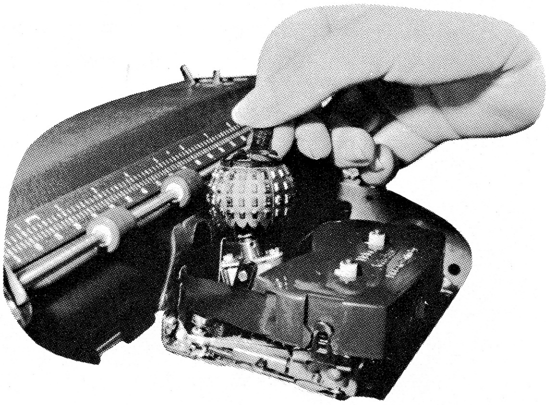

Fig. 10–21 Removing the 1428 element from the Selectric.

Removing the Element

1. Place the typewriter in lower shift, turn it off, and lift the front cover. The arrow on top of the element should be pointing toward the platen.
2. The element is removed from the notched element post by pressing the spring levers together and lifting upward.
3. After the element has been released from the notched post, one of the spring levers may be held to lift the element completely off the post (Fig. 10–21).

Replacing the Element

1. Make sure the typewriter is off and in lower-case shift.
2. Hold the element by the spring lever and place it on the element post. Be sure the arrow on top of the element is facing the platen. While pressing the spring levers together, press downward on the element. The element should slip into place with a click as the element is positioned onto the notched post. Do not force the element.

PROCEDURE FOR SETTING UP THE SELECTRIC TYPEWRITER FOR KEYPUNCH SIMULATION

1. Place the 1428 element on the typewriter.
2. Set the left margin stop at 0. Set the right margin stop at 80.
3. Turn on the typewriter.
4. Position the paper in the typewriter.
5. Set the Selectric for double spacing.
6. Place the typewriter into upper-case position and lock.
7. Be sure the ribbon position lever is not in the "Stencil" position.
8. Be sure the multiple copy control is pulled toward the operator.
9. If the carrier does not move, (a) turn the machine off for a few seconds and then back on, and (b) depress the margin release key.

TYPING TIPS FOR THE SELECTRIC TYPEWRITER

1. Be sure to keep the upper arms sloped slightly forward.
2. Keep the forearms on the same slope as the slope on the keyboard.
3. Keep the back erect. Use the backrest for support.
4. Keep the feet flat on the floor.
5. Begin typing slowly.
6. Always keep the fingertips close to the keys in a natural curved position (Fig. 10–22).

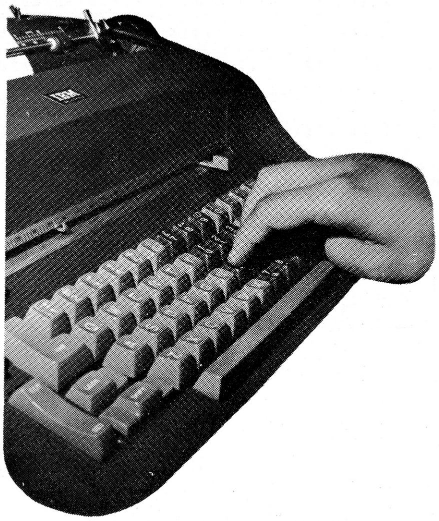

Fig. 10–22 Correct hand position in 10-key position.

7. Tap the key lightly and relax the fingers as soon as contact is made with the key.
8. The touch system for the numeric keys is as follows:

Index finger	digits 1, 4, 7
Middle finger	digits 2, 5, 8
Ring finger	digits 0, 3, 6, 9

SPEED AND SKILL EXERCISES

The numeric and alphabetic exercises contained in the Appendix have been designed to give the student practice in locating the numeric keys on the keypunch machine. The student is to type the exercise. By retyping over the finished copy, additional practice can be gained and the original work can be verified. The student should pay close attention to errors on a daily basis if all work is verified.

LABORATORY ASSIGNMENTS

1. Examine the Selectric typewriter and locate the various parts discussed in the text.
2. Practice removing and replacing the typing element.
3. Set the left margin stop at 0 and the right margin stop at 80.
4. Turn to the Appendix and do the punching assignments indicated by you instructor.

REVIEW QUESTIONS

1. How is the typing element removed?
2. How are the margins set?
3 What is the purpose of the dual velocity cam lever?

QUESTION CARDS

Figures 10–23 through 10–26 contain questions that are to be interpreted. Write the question and the answer to the question on a separate sheet of paper.

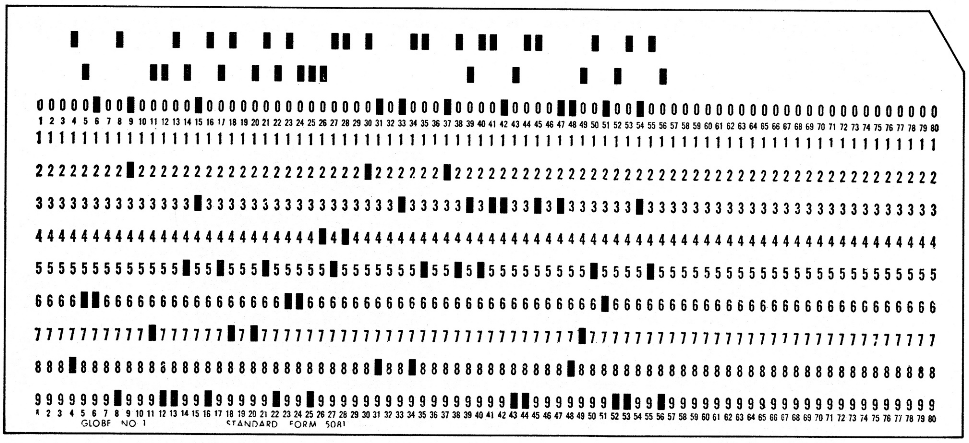

Fig. 10–23

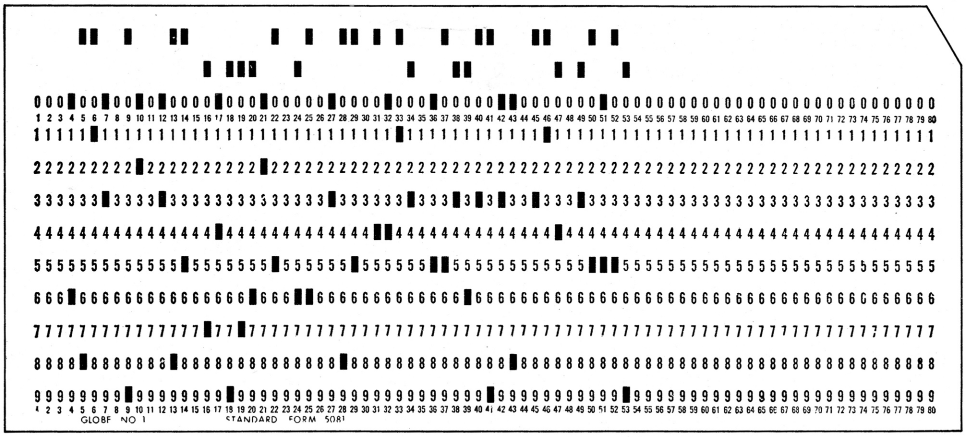
GLOBE NO 1
STANDARD FORM 5081

Fig. 10–24

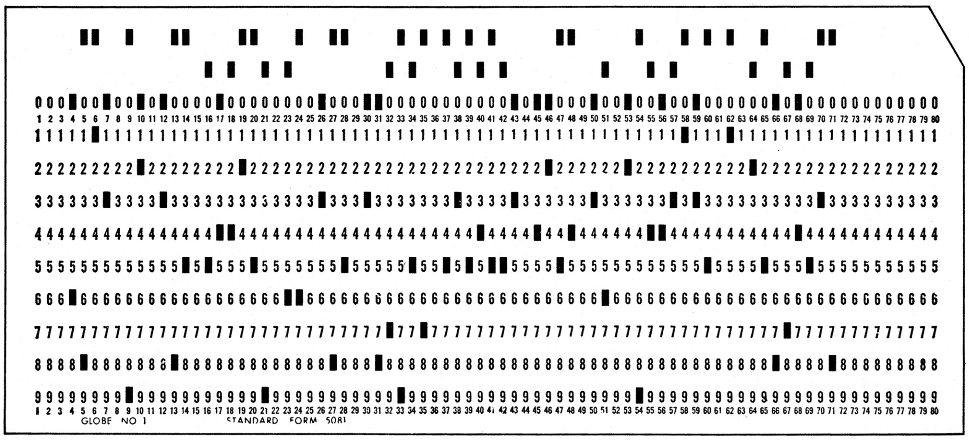
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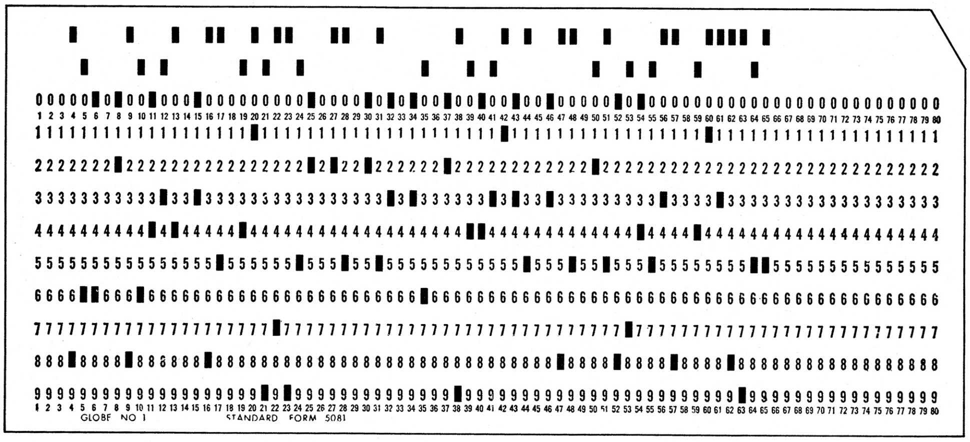
Fig. 10–25


GLOBE NO 1
STANDARD FORM 5081

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APPENDIX

PUNCHING EXERCISES appendix

NUMERIC KEYPUNCHING: EXERCISES 1–12

The following exercises are designed to familiarize the student with the numeric portion of the keyboard. In addition they may be used as practice exercises at any time to increase speed and accuracy of punching. These exercises are also to be utilized when using the Selectric typewriter and constitute the main body of the Selectric drills.

General Instructions: 24, 26, and 29 Keypunches

1. Place a blank card on the program drum.
2. Place the starwheels down and turn on the auto feed and print switches.
3. Keypunch the assignment without spacing between columns. Upon completion of each card, visually verify and make any necessary corrections by creating a new card.
4. Circle each error and keep the error cards separate from the correct deck.
5. Time yourself and keypunch the assignment once again, but go straight through and do not stop after each card to verify.
6. Use the accompanying chart to find your punching speed measured in keystrokes per hour. Record the time and speed in your notebook and also on a separate card to be turned in to the instructor.
7. Visually verify and rekeypunch any cards containing errors.
8. Turn in all cards to the instructor.

Selectric Typewriter Instructions

1. Set the margin stops at 1 and 80.
2. Place a blank sheet of paper in the typewriter and be sure the 1428 typing element is in place.
3. Type the assignment without spacing between columns. Upon completion of each line, visually verify and make any necessary corrections by retyping the line. Any nonnumeric key will cause a special blocked character to print and should be regarded as an error. With a pencil circle each error.
4. Time yourself and retype the assignment once again but go straight through and do not stop after each line to verify.

5. Use the accompanying chart to find your punching speed measured in keystrokes per hour. Record the figures in your notebook and also at the bottom of the assignment to be turned in to your instructor.
6. Visually verify the exercise and retype any line containing an error.

Estimating Your Keypunching Speed

Approximate Number of Keystrokes	Keystrokes Per Hour	Time in Minutes
960	2,000	29
	3,000	19
	4,000	14
	6,000	9½
	8,000	7
	10,000	6
	12,000	5

EXERCISE 1

4554 5455 4445 5545 5545 4544 4545 4554 4455 4545 4554 4455 4454 5454 5544 5445 5445 5455 4445 5545
4565 5664 5664 5446 5446 6445 5654 5656 6646 4565 4564 4565 4565 5654 6545 4656 5664 6554 6546 5664
5664 5664 5464 5644 4566 4465 5456 6446 5644 6645 5664 5664 5465 6564 6565 6645 4464 5466 4566 6456
4556 5564 5654 6554 5564 5456 4566 5645 4556 5564 6554 5564 5645 6545 6554 5465 5546 5456 4566 5564
5466 4566 5456 5446 5465 6645 5445 5544 5445 5544 4544 5465 5665 4564 4554 4565 5466 5446 5465 6645
6445 4644 5645 6554 4565 5664 4456 6654 6445 6544 6445 4554 6445 6445 4654 4644 5645 6554 4565 5664
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5466 4566 4456 5456 6445 5644 6645 5664 5664 5465 6564 6565 6645 4464 5466 4566 4465 5456 6445 5644
4556 5564 5654 6554 5564 5645 6545 5564 5465 4655 5546 5456 4566 5646 5664 5564 5654 6554 5564 5645
5466 4566 5456 5446 5456 6645 5445 5544 5445 5544 4544 5465 5664 4564 4554 4565 5466 4566 5446 5445
6554 4565 5664 4456 6654 6445 6544 5445 6544 6445 4554 6455 6554 4654 4644 5645 6554 4565 5664 4456
5465 4655 5546 5456 4566 5646 4556 5564 4556 5564 5654 6554 5564 5645 6545 6554 4564 4655 5546 5446

EXERCISE 2

4256 4356 5146 5246 5346 6156 6256 4114 1414 4114 1414 5225 2525 6336 3636 4156 4256 4356 4146 5346
3456 4365 6534 6543 6354 6356 4125 6356 4125 5126 6124 4235 5236 6234 2345 3456 3654 3465 4365 6543
1423 1243 1523 1623 1263 1245 1254 4123 6123 4123 6123 6123 1234 1235 1236 1423 1234 1523 1245 1254
5612 6512 4623 6423 1246 1264 1246 1264 1256 1265 2346 2364 2365 2356 4612 6412 5612 6512 4623 6423
1652 1263 1243 1253 1523 3146 3164 3136 1314 2316 4254 3542 3425 1256 1562 1652 1263 1253 1243 1523
5413 5136 4325 5316 6325 1236 5643 1236 5643 3215 3421 4351 4621 4543 4615 4623 5413 4136 4325 3165
5123 1264 3164 5643 5225 5126 6123 3614 4114 6356 4123 1246 3146 1236 1414 4125 5123 1264 3164 5643
5146 5246 5346 6156 6256 4114 1414 5225 2525 6336 3636 4156 4256 4356 5146 5246 5346 6156 6256 3636
3654 3465 4365 6534 6543 6545 6356 4125 6356 4125 5126 6124 4235 5236 6234 2356 2654 3465 4365 6534
1623 1263 1256 1254 4123 6123 4123 6123 5123 1234 1235 1236 1423 1234 1523 1253 1623 1263 1245 1254
6412 5612 6512 4623 6423 1246 1264 1246 1264 1256 1265 2364 2365 2356 4612 6412 5612 6512 4623 6423
1652 1263 1243 1243 1423 3146 3164 3146 3164 3614 3416 4254 3542 3524 1256 1562 1652 1263 1243 1523

EXERCISE 3

4757 4758 4759 5758 5859 5957 6768 6869 6967 4784 4894 4747 5858 6969 4757 4758 4759 5758 5859 5957
5978 6987 6879 6789 7856 8746 6589 9864 4678 8974 5867 5745 5785 5745 5784 5895 4978 6987 6879 6789
1474 7414 4714 1741 2585 8525 5825 5852 2852 3696 9639 6936 6936 3963 4736 5873 1474 1474 4714 2585
1593 3576 2543 7128 9435 7564 9481 1954 2743 1954 2743 6182 5726 8364 2478 3597 1593 3576 2543 9128
4718 2147 3657 9674 9137 5319 6139 2459 2648 2459 2648 2438 1234 5678 6789 9312 4719 2147 2437 9674
9487 8296 4826 5738 5283 6481 3169 2617 3179 2617 9517 3575 6517 6382 4613 7849 9587 8296 4826 5738
5858 5785 7414 2743 2648 2617 6969 5895 4714 2438 4747 5745 1474 1945 2459 3179 5858 5785 7414 2743
6879 6789 7856 8746 6589 9864 5789 8974 5879 5745 5785 5745 5875 5895 5978 6987 5879 5789 9864 4678
8525 5825 2852 3696 9636 6936 6936 3963 4736 5873 1474 4714 1741 2585 8525 5825 2852 3696 9636 6936
1954 6182 5726 8364 2478 3597 1593 3576 1432 7128 9435 7564 9681 1954 2743 1954 2743 6182 5726 8364
6789 9412 4718 2147 3657 9674 9137 5319 6139 2459 2648 1459 1648 2438 1234 5678 6789 9412 4718 2147
3179 2617 9517 3575 6517 6382 4613 7849 9587 8296 4826 5738 4283 6481 3179 2617 3179 2617 9517 3575

EXERCISE 4

3062 4560 4650 4650 4065 6054 1230 1203 6303 6036 6303 3063 6030 3036 6230 6302 3062 4560 4650 4065
7804 6790 5041 5409 2508 1045 3057 1023 1470 1023 1470 2580 3690 3069 5802 4701 7804 6790 4051 5490
2594 1067 3407 6048 9150 4501 5206 4501 5206 3508 9702 4017 8106 7920 5267 4892 2504 1067 3407 6048
5742 3012 5407 8403 8069 7208 5046 9325 2051 1402 8370 6390 4840 6390 5840 7083 5742 3012 5406 8403
6408 2408 6401 5190 7301 1907 2904 7026 3049 1068 8430 5407 4910 5407 4910 5970 6408 2508 6401 5109
7104 6018 2079 7620 2980 4052 7601 7043 8406 5019 1054 6025 1054 5026 8053 2069 7104 6018 2079 7620
6390 5407 1054 6036 1470 5206 5840 4910 6025 3063 2580 3508 4970 6303 1023 4501 6390 5407 1054 6036
4701 7804 6790 5041 5409 2508 1045 3057 1023 1470 1023 1470 1580 3690 3069 5802 4701 7804 6790 5041
8106 7920 5267 4892 2504 1067 3407 6048 9150 4501 5206 4501 5206 3508 9702 4017 8106 7920 5267 4892
3012 5406 8503 8069 7208 5046 9325 2051 1502 8370 6390 5840 6390 7083 5742 3012 5406 8503 8069 7208
6408 2508 6401 5109 7301 1907 2904 7026 3049 1068 8430 5407 4910 5970 6408 2508 6401 5109 7301 1907
2079 7620 2980 4052 7601 7043 8406 5019 1054 6025 1054 8043 2079 7104 6018 2079 2980 4052 7601 7043

EXERCISE 5

7056 8935 1802 3048 5792 6057 1582 6709 5140 1056 7493 5031 4902 1469 3402 1009 5076 8935 1802 3048
4903 7341 5178 2094 2108 2894 5693 1805 7940 3892 6194 5043 9257 1890 1874 6789 4903 7342 5178 1094
3569 4107 1784 3208 6187 5694 3590 1045 7453 3865 1674 4902 6105 4398 2580 1074 3659 4107 1784 3208
6507 5398 2974 7506 2851 9076 1705 4790 2983 6961 3406 6501 3957 9641 2043 9001 6507 5398 2974 7506
1001 5067 3985 7952 5076 5821 7096 4051 7940 8923 6961 4036 5016 9537 4691 4023 9001 5067 9385 8021
9024 6419 4032 9001 5067 9384 8021 4038 7952 6057 8521 7069 4051 7940 8923 6961 4936 5017 9537 4691
4063 2597 8910 8715 8769 9023 3471 1785 9024 1028 8924 5693 8015 4970 8932 1954 5063 2597 8910 8715
7814 2038 1867 5954 5930 4015 4573 8653 6714 8024 1065 3948 4820 7014 5630 1047 7814 2038 1856 4954
6491 4032 9805 5760 9358 7925 6057 5821 7096 4051 7904 8932 5915 4063 5016 9537 6491 4032 9805 5670
9070 5689 3518 2030 4857 9260 5715 8267 9051 4067 6150 3759 3149 2014 6934 2010 9070 5689 3518 2030
4392 5718 9018 7567 8949 3073 4151 7820 9421 8028 9456 9318 5079 4038 9261 9460 4392 5718 9018 7567
8910 8715 8769 9034 3471 1785 9024 1028 8924 5693 8015 4970 8932 1954 4063 2597 8910 8715 8769 9034

EXERCISE 6

3892 6194 6943 1890 6789 4930 7341 5178 2094 2180 2894 5693 1850 7904 3892 6194 6943 9257 1890 1875
5037 5931 4902 1469 3402 1090 7056 8935 1820 3048 5792 6057 1582 6790 5170 6761 5037 5931 4902 1469
5957 6093 5879 2560 5758 2107 9640 5179 5089 3269 1640 6305 1694 3754 9179 3298 5057 6093 5879 2560
1456 3910 4778 1420 3818 6759 5459 3040 1545 7386 5367 5367 1408 2401 6539 4858 2070 1456 3910 4778
1087 2587 8690 3434 7117 8590 2410 2889 2456 9380 1549 7089 3219 6440 6235 9789 1087 1587 8690 3434
1940 3290 1050 6793 8580 2104 3879 5260 5785 2107 6914 5050 6159 7330 1590 2464 1940 3290 1050 6793
1050 6739 8779 5250 7658 2170 9640 5179 4089 3269 6140 3650 1695 3746 9140 2310 1050 6739 8779 5250
9829 9595 6028 5190 6514 5047 9029 8369 6134 6065 1039 5796 4120 4390 1065 7053 9829 7575 6028 5190
8432 8061 8756 9435 9010 4574 5338 6516 7440 8261 5043 9825 8010 7435 5941 7017 8432 8061 8756 9435
8049 3073 4151 7820 9421 8028 9456 9318 5029 4038 9261 9460 4392 5718 9028 7567 8949 3073 4151 7820
9070 6789 3518 2030 4857 9260 5715 8267 9051 4010 5675 9350 3149 1014 6934 2010 9070 5689 3518 2030
1050 6793 8580 2104 3879 5260 5784 2107 5914 5050 6159 7330 1590 2464 1940 3290 1067 8580 2104 3879

EXERCISE 7

7820 9421 8028 9456 9318 5079 4038 9261 9460 4392 5718 9018 7567 8949 3073 4151 7820 9421 8028 9456
3518 2030 4857 9260 5715 8267 9051 4056 5160 3759 3149 2014 5934 2001 9070 5689 3518 2930 4857 9260
7096 4051 7940 8932 6916 4063 5016 9537 6491 4032 9850 5760 9358 7925 6057 5821 7096 4041 7940 8932
5954 5930 4015 4573 8653 6714 8024 1065 3948 5820 7014 5639 1047 7814 2938 1867 5954 5930 4015 4573
1028 8924 5693 8015 4970 8932 1964 4062 3597 8910 8715 8786 9034 3471 1785 9024 1028 8924 5693 8015
9010 5067 9385 8021 4038 7952 5067 8521 7069 1450 5061 5973 3015 9024 6419 4032 9010 5067 9385 8021
2987 7952 5076 5821 7096 4038 7952 5067 8521 4036 5016 9537 4691 4023 1010 5067 3987 7952 5076 5821
2975 7560 2851 9076 1450 4790 2983 5951 3460 6510 3946 9641 2043 9010 6570 5398 2975 9560 2851 9076
6187 5694 3590 1045 7453 3865 1674 4082 6150 4398 2580 1074 3569 4170 1784 3280 6187 5694 3590 1045
5178 2094 2180 2984 5693 1850 2970 3892 6194 5043 9257 1890 1875 7890 4930 7341 5178 2094 2180 2894
3048 5792 5057 1582 6790 5170 1056 7593 5031 4920 1469 3420 1050 7056 8935 1820 3048 5792 5057 1582
6934 2001 9070 5689 3518 2030 4857 9260 5715 8267 9051 4067 6150 3759 3149 2014 6934 9421 8028 9318

EXERCISE 8

1890 1875 6789 4930 7341 5178 1094 2180 2894 5693 1850 7940 3892 6194 6043 9257 1890 1875 6789 4930
1820 3048 5792 6057 1582 6790 5140 6761 5037 5931 4920 1469 3420 1090 7056 8935 1820 3048 5792 5047
2560 5758 2170 9640 5179 4089 3269 1640 6350 1596 3764 9140 3298 5057 6093 5879 2560 5758 2170 9640
6759 5459 3040 1545 7386 5386 5367 1480 2410 4858 2070 1456 3910 4778 1420 3818 6759 5459 3040 1545
3417 8590 2410 2889 1456 9380 1549 7089 3219 5440 6235 9789 1087 1587 8690 3471 3417 8590 2410 2889
6793 8580 2140 3879 5250 6784 2170 6914 5050 6159 7330 1590 2464 1940 3290 1050 6793 8580 2140 3879
5250 7668 2170 9640 5179 4089 2369 6140 3650 1695 3746 9170 2310 1050 6739 8779 5250 7668 2170 9640
5190 7614 5047 2983 6134 6965 9029 1039 5796 4120 4390 1065 7053 9829 7476 5928 5190 6714 5047 2983
9340 3471 7158 0924 8120 8924 6953 8510 5905 8932 0925 8010 7435 5941 6518 7859 9340 3471 7458 0924
7852 5067 8521 7950 1450 7684 5930 9351 9270 4691 4320 9002 5607 3985 8210 5083 8210 7852 5067 8521
7014 5829 1604 8048 7159 4802 1964 2583 1027 8901 6748 7849 1087 3789 0261 1649 7014 5829 1504 8048
1050 6793 8580 2140 2879 5150 6785 2170 6914 5050 6159 7330 1590 2464 1940 3290 1050 6793 8580 2170

EXERCISE 9

4565	4565	5654	5654	6545	6545	5456	5456	4655	4655	5564	5564	6455	6455	5546	5465	5465	5465	5645	1 × Release
1565	1454	5651	5651	6515	6515	5156	5156	1655	1655	5561	4561	6155	6155	5516	5516	5516	5165	5615	2 × Release
4562	4562	2654	2654	6245	4326	4652	4542	2564	2564	5442	6425	5245	5246	5462	5462	5642	5642	2645	3 × Release
4535	3453	5354	5354	3545	5453	5453	3454	5453	4355	5534	5534	3455	3455	5543	5543	5443	5435	5435	4 × Release
4512	4512	1254	2154	5612	5612	2165	2165	5124	5124	4215	4215	2451	2451	2451	2561	2561	4621	4261	5 × Release
4513	4513	3154	5613	5613	3165	3165	5124	5134	4315	4315	3451	3451	3451	3561	3561	1463	1463	4361	6 × Release
4523	4523	2354	3254	5623	5423	3265	3265	5234	6234	4325	4325	3452	3452	3562	3562	2463	2463	4362	7 × Release
5676	5687	5656	6565	7656	4576	7564	7685	7458	4765	8675	9845	8765	8197	5674	7654	7686	7556	5675	8 × Release
7543	8764	9834	6547	8648	8642	5789	1197	6519	7532	7642	4678	4645	8665	4567	9654	6784	8643	6793	9 × Release
8641	8567	8642	6890	7642	9907	7685	8646	8778	6754	7645	6754	7878	8768	7856	6578	6785	0984	6794	10 × Release
1876	5619	7653	5465	8979	7867	9897	5634	0979	1819	1564	7613	5641	8573	2468	0975	3186	2456	6867	11 × Release
8976	4519	5664	5647	8754	0986	4568	7654	5789	6534	0987	6573	7654	5688	3468	9761	1857	8765	7531	12 × Release

EXERCISE 10

7565	7565	5657	5657	6575	6575	5756	5756	7655	7655	5567	5567	6755	6755	5576	5576	5765	5765	5675	1 × Release
4568	4568	8654	8654	6845	6845	5486	5486	4658	8564	8564	6485	6485	5846	5846	5486	5486	5468	5648	2 × Release
4595	4595	5954	5954	9545	9545	5459	5459	4955	4599	5594	5594	9455	9455	5549	5549	5495	5495	5945	3 × Release
4578	4578	8754	8754	5678	5678	8765	8765	5784	5784	4875	4875	8457	8457	4567	8567	7468	7468	4867	4 × Release
4579	4579	9754	9754	5679	5679	9765	9765	5794	5794	4975	4955	4975	9457	9457	9567	9567	7467	7467	5 × Release
4589	4589	9854	9854	5689	5689	9865	9865	5894	5894	4985	4958	9458	9458	9568	9568	8569	8596	4968	6 × Release
8655	5893	4432	7890	9764	3686	2437	2580	4580	6853	5497	4683	4578	2556	2375	5731	1895	8169	1980	7 × Release
5479	6932	7114	8871	6900	0374	4475	6654	6090	3681	1615	4583	7081	0071	3960	4711	2867	3354	5422	8 × Release
3367	5632	7254	5781	7181	5781	7181	6532	3376	3981	6701	3546	7865	1181	9768	6758	4839	9758	0341	9 × Release
0081	1876	2030	5978	6758	6700	5690	8765	4653	5432	7895	7810	0004	7718	9780	5546	7856	8674	1278	10 × Release
1174	6859	5849	5060	5822	8225	9046	5822	6093	2245	6169	0876	1675	5768	9432	2238	5643	1978	8190	11 × Release
6790	5674	8763	1189	7856	7845	9067	1189	5638	6723	6810	7650	8734	7789	1109	4588	8769	1109	6758	12 × Release

EXERCISE 11

1471	1471	1741	1741	4711	4711	1174	1174	7114	7114	4117	4117	1147	1147	7411	7411	1741	4171	1471	1 × Release
2582	2582	2857	2857	5822	5822	2285	2285	8225	8225	5228	5228	2258	2258	8522	8522	2852	5282	5282	2 × Release
0369	0369	9630	9630	0690	3690	0963	0963	6903	6903	3096	3096	9036	9036	6309	6309	0639	3960	6093	3 × Release
1471	2582	0369	1471	2582	0369	1714	2852	9630	1741	2852	9630	4711	5822	3690	4711	5822	3690	1174	4 × Release
2285	0963	1174	2285	0963	1114	8225	6903	7114	8225	6903	4117	5228	3096	4117	5228	3096	1147	3258	5 × Release
9036	1147	2258	9036	7411	8522	6309	7411	8522	6309	1741	2852	0539	4171	5282	3960	1417	2528	6093	6 × Release
1417	2285	9036	2582	0936	1147	0369	1174	2295	1417	2285	9036	2582	0963	7411	0369	7114	8522	1741	7 × Release
8225	6309	2852	6903	7411	9630	7114	8522	1714	8225	6309	2852	6903	1714	9603	4117	3852	4711	5228	8 × Release
8639	5822	3096	4171	3690	4117	5282	4711	5228	3960	5822	3096	1417	3690	1147	2528	1174	2258	6093	9 × Release
7565	5687	4568	6845	4689	5567	0375	7189	5671	0918	3489	2857	0956	4171	5282	4711	5822	3691	1171	10 × Release
3267	2021	9851	5614	5790	5432	7908	6754	9060	1578	1294	0639	5845	8533	8854	4568	0901	5667	9859	11 × Release
5903	4532	5679	9051	6750	6789	5432	8670	5674	9806	1439	0304	5040	1967	9701	3457	8674	5795	1597	12 × Release

EXERCISE 12

1595	1595	5951	5051	1295	1295	5921	5921	1895	1895	5981	5981	1892	1892	2981	2981	8291	8201	1928	1 × Release
3575	3575	5753	5753	3275	3275	5753	5725	3875	3875	5783	5783	3872	3872	2783	2783	8273	8373	3782	2 × Release
1575	1575	5751	5751	1275	1275	5721	5721	4721	1875	1875	5781	5781	1872	1872	2781	2781	8271	1728	3 × Release
3595	3595	5953	5953	3295	3295	5923	5923	3895	3895	5983	5983	3895	3892	2983	2983	8293	9293	3928	4 × Release
2486	2486	6842	5842	2864	2864	4682	4682	2684	2684	4862	4862	8246	8246	6428	6428	4268	4268	6482	5 × Release
1379	1379	9731	9731	1397	1397	9731	9631	1937	1937	7391	7391	1973	1973	3791	3791	1793	1739	9371	6 × Release
0102	0102	2010	2010	2010	0340	0304	4030	3040	0506	0506	6050	6050	0708	0708	8070	8070	0900	0900	7 × Release
1079	1079	9701	9701	1097	1097	7901	7901	7901	1907	7917	7091	7091	1970	1970	0791	0791	1790	1709	8 × Release
0014	0041	0025	0052	0036	0063	0047	0074	0058	0085	0069	0096	0017	0071	0028	0082	0039	0093	0070	9 × Release
0003	0030	0300	0060	0006	0900	0009	0002	0020	0700	0007	0040	0050	0500	0001	0008	0080	0400	0004	10 × Release
3919	1014	7571	9781	2864	6451	5721	1875	1875	5781	2920	6481	4293	3902	9987	1117	8857	8991	7429	11 × Release
3800	9911	7181	6158	5748	5714	3892	4938	3849	4832	3829	4857	5811	4488	4751	3939	4938	4441	5733	12 × Release

ALPHABETIC KEYPUNCHING: EXERCISES 1–10

General Instructions: 24, 26, and 29 Keypunches

1. Place cards in the hopper of the keypunch and turn on the main-line switch.
2. Raise the starwheels by means of the program control lever.
3. Turn on the auto feed switch and feed two cards.
4. If a printing keypunch is used, turn on the print switch.
5. Keypunch the assignments. Place a blank column after each word. After the first line has been keypunched, release the card and visually verify it for accuracy. If the card is accurate, keypunch the next line of data and continue until the assignment has been completed. If there is a keypunch error or errors, duplicate the card up to the card column containing the error, make the proper correction, and then duplicate the rest of the card.
6. Upon completion of the assignment, remove the error cards and with a pencil circle each card column in error. Keep both the correct cards and error cards.
7. Keypunch the exercise again. However, time yourself to see how long it takes to complete the exercise. Keypunch as rapidly as possible but keep in mind that accuracy is extremely important.
8. Calculate the length of time required to complete the assignment and use the accompanying chart to find your keypunching speed in keystrokes per hour. Put these figures on a separate blank card with your name to be turned in to the instructor.
9. Visually verify the cards for accuracy. Any card that contains errors must be corrected by rekeypunching. Do your errors follow a pattern? Do the same type of errors keep appearing?
10. Keep the error cards as well as the correct cards to be turned in to the instructor.
11. If time remains in the period, turn to one of the alphabetic practice exercises and practice punching those exercises that improve your weakest fingers.

Selectric Typewriter Instructions

1. Be sure the standard typing element is on the typewriter.
2. Place the margin stops at 1 and 80.
3. Type the assignments. Place a blank column after each word.
4. After the first line has been typed, visually verify the card for accuracy. If the line contains no errors, return the carriage and type the next line. If there is a typing error, retype the line again until it is perfect. Then go on to the next line.
5. Upon completion of the assignment, circle each letter in error with a pencil. Keep this assignment to be turned in to the instructor.

6. Place a blank sheet of paper in the typewriter and retype the exercise again. However, time yourself to see how long it takes to complete the exercise. Type as rapidly as possible but keep in mind that accuracy is extremely important.
7. Upon completion of the exercise, calculate the length of time it took and use the accompanying chart to find your typing speed, measured in keystrokes per hour. Record the time and the keystrokes per hour at the bottom of the paper.
8. Visually verify the exercise for accuracy. Circle any errors found. Note the type of error and which finger caused the error. Do your mistakes seem to follow a pattern?
9. On a separate sheet of paper retype each line that contains errors.
10. Be sure your name is on all papers to be turned in to the instructor.
11. If time remains in the period, practice the exercise and choose another exercise that will strengthen your weakest fingers, based upon the number of errors per finger.

Estimating Your Keypunching Speed

Approximate Number of Keystrokes Per Exercise	Keystroke Speed in Keystrokes Per Hour	Time Required to Keypunch Assignment in Minutes
600	2,000	18
	4,000	9
	6,000	6
	8,000	4½
	10,000	3½
	12,000	3

A record of your punching speed and accuracy should be kept. Only in this way will you be able to note your improvement in speed and accuracy. The following chart is suggested as a form to use for your record.

Week	Average Keystrokes Per Hour					Number of Errors Per Assignment	Average Weekly Keystrokes Per Hour	Number of Errors Per Week
	M	T	W	Th	F			
1.								
2.								
3.								
4.								
5.								
.								
.								
.								

EXERCISE 1

COLUMN
CODING
CONTROL
DETAIL
FIELD
GROUP
LISTING
PUNCH
READING
MACHINE
PROCESS
PERFORM

COLLATING
COMPARING
DUPLICATION
SUBTRACTION
SELECTING
ACCUMULATED
PREPUNCHING
DESCRIPTION
INTERPRETING
TABULATING
MECHANICALLY
FUNDAMENTALS

ADDITION
MERGING
ACCOUNTING
POSITIONS
COMBINATION
SUMMARY
INVENTORY
MINIMUM
SEQUENCING
VERIFIED
STATION
FUNCTIONS

APPROPRIATE
ENTERPRISE
SUMMARIZE
UTILIZING
CLASSIFIED
FEATURES
EQUIPMENT
PERFORMING
PERIODIC
VERIFICATION
ORGANIZATIONS
DEPRECIATION

HANDLING
BALANCE
PROCEDURE
DISCUSSIONS
PROPERTY
MAINTAINING
ACTUAL
SUBSIDIARY
DIVISIONS
BRANCH
FACTOR
VALUATION

CHANNEL
CARRIAGE
LEVER
WEIGHT
BRUSH
COUNTER
INDICATOR
CHUTE
CROSSFOOTING
EDITING
EMITTING
FANNING

EXERCISE 2

CYCLE
DECK
GAUGE
TAPE
CHIP
KNIFE
STOP
PANEL
ORDER
FORM
PROOF
BRAKE

NEEDLE
STRIPE
RUNOUT
SCORED
TENSION
THROAT
TOGGLE
VERNIER
STORAGE
HOPPER
STARTING
PANELS

JOGGLE
SCANNING
PROGRAM
PLATEN
POCKETS
WHEEL
RATCHET
PRINTING
MATCHING
CHECKING
PROVING
TRAILER

HOPPER
TERMINALS
INOPERATIVE
OPERATIONS
OFFSETTING
OVERFLOW
DISENGAGE
DISCONNECT
EXPOSING
REVERSING
STATION
MECHANISM

RESET
START
DIGITS
PROBLEM
PENCIL
DIVIDING
EJECTION
LETTERS
COLLATOR
SECONDARY
PRIMARY
MANUAL

CHARACTERS
ELECTRONIC
CALCULATING
STATISTICAL
COMPARISON
COLLECTION
STATISTICS
ARRANGED
ANALYSIS
EVALUATION
TABULATED
NUMERICAL

RESTORE
LOWER
STAR
SKIPPED
NORMAL
RELEASE
LIGHT
FUSE
CHIPS
CLUTCH
DEVICE
SYMBOL

EXERCISE 3

PIN-FEED
HAMMERSPLIT
INFORMATION
MAXIMUM
SCHEMATIC
RIBBON
CONTROLLED
OPERATING
TEAR-BAR
ASSEMBLY
CORRESPONDING
THICKNESS

INCHES
NOTCH
BRAKE
LEVER
MIDDLE
BEARING
HOUSING
RUBBER
SHAFT
SUPPORT
TAPES
RESTORE

POINTING
POSITION
PURPOSE
ADJUST
OVERLAP
CREASES
TRAVELING
TIGHTLY
TYPEBARS
REVIEW
CHANNEL
PRINTING

EXTENDS
SHIFT
GUIDE
EDGES
FORMS
DESIRED
CONTROL
WIRING
FACTOR
PUNCH
EXAMPLE
LOCATE

GROMMETS
MARGINAL
OPTIONAL
ADJUSTMENT
QUESTIONS
PRESSURE
LATERALLY
ACCOUNTING
NARROWER
INSTALLATION
ILLUSTRATIONS
EQUIDISTANTLY

SCORED
SIMPLIFIED
REMOVABLE
ASSEMBLIES
IDENTIFYING
CHANGING
REPLACING
STORING
SHIPPING
CYLINDER
POSITIONING
COUPLING

EXERCISE 4

SCANNING
STACKER
HOLDING
SCREW
PLATE
INSERT
CENTER
TOOTHED
BACKSPACE
DEPRESSED
SPINDLE
CLEARED
REVOLUTION
AUTOMATIC
ALTERNATELY
CLAMPING
DEFINITION
AUTOMATICALLY
MANUALLY
APPLICATION
REMAINDER
SUPPRESS
STUDENTS
QUANTITY
VENDERS
CURRENT
AMOUNT
NUMBER
VENDERS
COURSE
CLASS
HOURS
GRADE
CURRENT
STRIP
RIGHT
PREPARE
PAYROLL
SOCIAL
EMPLOYEE
ENTRY
EARNINGS
STATUS
ATTACH
ALIGN
SHEET
STAPLE
DRAWN
SECURITY
PROVIDED
SUMMARY
INVOICE
PERIODIC
FACTOR
LOCATION
PLANT
RECORD
BASIC
INSTALLED
VALUE
DEPRECIATION
DESCRIPTION
EQUIPMENT
ACQUISITION
CURRENT
DIFFERENCE
REMAINING
HANDLING
TRANSFERS
MACHINES
RETIREMENT
BUSINESSES
MERGED
CHOSEN
CAPITAL
GRIDDER
COMMON
NOTICE
GAUGE
RESERVE
MODELS
ADVANTAGE
SUBSIDIARY
ACCOUNTING

EXERCISE 5

ANNUAL
PHYSICAL
ACCOUNTING
COMPUTATIONS
STRAIGHT
METHOD
SIMPLEST
VARIOUS
ATTITUDES
CONCEPTS
POINTLESS
FAVORABLE
VALUATION
MONTHLY
LOCATION
EXPIRATION
ACQUIRED
UPDATED
FOOTING
FIELDS
VISUAL
PRINTING
PRICE
NUMBERS
PRODUCT
CUSTOMER
WIRED
AVAILABLE
SUBTRACTION
PROCESSING
MACHINE
PANELS
CREDIT
UNEQUAL
SMALLEST
CATEGORY
COMPARISON
FLEXIBILITY
UNRELATED
SUCCESSIVE
SIGNIFICANT
CONTAINING
SALESMAN
ACTIVITY
INTERMEDIATE
DETAILED
MEANINGFUL
SIMULTANEOUSLY
PURPOSE
CAPACITY
SECTION
CONTAINS
CHARACTERS
REFERENCE
EXAMPLE
MINIMUM
ANALYTICAL
SPECIFIC
REFLECTING
PREPARED
BRUSH
FANNING
NOTCHED
ERROR
STATION
RECORDED
WRITER
ACTIVATED
DEPENDING
SPECIAL
OPERATES
SERIALLY

EXERCISE 6

ANALYZED
PREDETERMINED
MARGINALLY
TENSION
SUPPRESSION
MECHANISM
COMPARING
AUTOMATIC
PROCEDURE
INDICATOR
PREPARATION
PRESSURE
REQUIREMENTS
CYLINDERS
CONTINUOUS
DISENGAGED
CORRESPONDING
DAMAGED
SUMMARY
DUPLICATE
AUTOMATICALLY
GANGPUNCHED
FOLLOWING
FINGER
FUNCTIONAL
NONREMOVABLE
TABULATION
SUGGESTIONS
MISSORTING
OTHERWISE
INDEPENDENT
IDENTICAL
CONNECTOR
INFORMATION
INTERSPERSED
PRINTING
FOLDED-FORM
IDENTIFYING
CONTINUOUSLY
STATISTICAL
IMMEDIATELY
ARRANGEMENT
FUNCTION
SYNCHRONIZED
CONTROLLING
REPRODUCE
SELECTRIC
MECHANISM
THROAT KNIFE
MANUFACTURED
PLATEN
ELIMINATION
STRAIGHTENED
MANUALLY
SCHEMATIC
ALTERATION
REQUIREMENTS
ORIGINALLY
SEQUENCE
READING
SKIPPING
INSTALLATION
POSITION
INSERTION
DEPORTMENT
BACKSPACE
THROUGHOUT
SWITCHES
DIAGRAM
DETAIL-MASTER
REPLACEMENT
BOARD

EXERCISE 7

INTEGRATOR
LIBRARIAN
OPERATION
KILOCYCLE
SUBROUTINE
ULTRASONICS
VOCABULARY
XEROGRAPHY
Y PUNCH
ZERO STATE
KILOBAUDS
MAINTENANCE
MINUEND

ELECTRONIC
DUPLEXING
DRUM MARK
DOCUTERM
DISJUNCTION
DIAGNOTOR
CROSSFOOT
CONSTRAINT
CODE ERROR
CLOCK RATE
LIGHT PEN
MICROCODE
MULTIPLEX

BLOCKMARK
BINARY ROW
BIQUINARY
BILLICYCLE
AUTOPLOTTER
BACKSPACE
AZIMUTH
ATTENUATE
AREA SEARCH
AMPHIBOLY
LOCATIONS
MICROWAVE
NANOSECOND

EMPIRICAL
EXCHANGE
FINE INDEX
FIXED POINT
FLOWCHART
FRAGMENTING
GENERATION
GO AHEAD
GROSS INDEX
HALF-ADDER
MAGNITUDE
MICROFARAC
NORMALIZE

MARK SENSING
MASK WORDS
MASTER RECORD
MATHEMATICS
MEGACYCLE
INTERBLOCK
INTERLEAVE
INTEGER
INSTRUCTION
INPUT UNITS
LONGITUDINAL
MULTIADDRESS
OPTIMIZE

DUPLICATION
DUPLEXING
DUMP POWER
DATANAME
DATAMATION
DATA REDUCTION
DATAPLOTTER
AUGMENT
AUDIT TRAIL
ATTENUATE
MACRO SYSTEM
MONOSTABLE
ORDERING

EXERCISE 8

CRYOGENICS
DISJUNCTION
PHONEME
PREANALYSIS
POLYVALENCE
PSEUDOCODE
QUINARY
RECOMPLEMENTATION
RECURSION
REDUNDANCY
REGENERATION
REPERFORATOR

REPERTORY
RESTITUTION
SAMPLING
SEMANTEME
SEMANTICS
SIMULTANEITY
SUBROUTINE
SUBSTRATES
SUBTRAHEND
SYMBIONTS
SYNCHRONIZER
TELEPRINTER

TELECOMMUNICATION
TELEPROCESSING
ULTRASONICS
XEROGRAPHY
ASYNCHRONOUS
ATTENUATION
AVAILABILITY
CONCORDANCE
DOCUMENTATION
JUXTAPOSITION
KILOMEGACYCLE
MACROPROGRAMMING

MODULARITY
MULTIPLEX
MULTISTATION
OVERMODULATION
PERIPHERAL
PRESELECTION
DOCUMENTOR
INTERPRETER
ITERATION
ISOCHRONOUS
KILOBAUDS
MATRIX

EXERCISE 9

DECODER
DERATING
DENSITY
HYPERTAPE
DISSECTOR
CRYOTRON
SYMBIONTS
SYNCH
LOGICAL
OPTICAL
MULTIPLEX
INTRAFAX

DUODECIMAL
INTERPRETIVE
RECOGNITION
REAL-TIME
MULTIPLEXER
CONCURRENCY
XEROGRAPHY
ZATOCODING
STOCHASTIC
AUTOCOMM
REPETITION
REMOTE-DATA

REMOTE
RESET
SOURCE
READ-IN
OVERLAY
PANEL
OPERAND
NEEDLE
NEXUS
N-CUBE
NOISY
NIXIE

NONDESTRUCTIVE
NONEQUIVALENCE
NONERASABLE
NONVOLATILE
NONREPRODUCING
NONARITHMETIC
NONPRIORITY
ALLOCATION
INTERMEDIATE
SEMICONDUCTOR
SEQUENTIAL
SERVOMECHANISM

SEMANTICS
SEMANTEME
SERVICING
SENSITIVITY
SERIAL
PROGRAM
OVERFLOW
PARAMETER
PARALLEL
OVERPUNCH
REGISTER
RED-TAPE

SIGNAL
SYSTEM
ERROR
SNAPSHOT
DYNAMIC
INTERFACE
PERIPHERAL
COUNTER
PROCESSOR
MONADIC
MONOSTABLE
MODULE

EXERCISE 10

ACCESS ARM
ACCESS TIME
ACCUMULATOR
ADVANCE ITEM
ALGORITHM
ALGORITHMIC
ALPHABETIC
ALPHAMERIC
AMPHIBOLOUS
ANNOTATION
APPLICATION
AREA, INPUT
AREA, OUTPUT
ASPECT CARD
ASYNCHRONOUS
ATTENUATION
AUTOPLOTTER
AVAILABILITY
BASE NUMBER
BATCH PROCESS
BAUDOT CODE
BILLICYCLE
BINARY CELL
BINARY ROW
BIQUINARY
BIT LOCATION
BIT PATTERN
BLOCK SORT
BRANCHING
BRANCHPOINT
BROADBAND
BURST MODE
BULK STORAGE
CALL NUMBER
CAMERA MOUNT
CARD CHECKING
CARD HOPPER
CARD READER
CARD SYSTEMS
CHAIN CODE
CHADDED TAPE
CHECK DIGIT
CLEAR BAND
CONSTANT AREA
CONTROL GRID
CONTROL CARD
CONTROL TAPE
CRYOGENICS
CYCLE SHIFT
DATA STATION
DEBLOCKING
DEBUGGING
DETAIL FILE
DICTIONARY
DIRECT CODE
DISJUNCTION
DISK FILES
DISPLAY TUBE
DISPLAY UNIT
DOCUMENTATION

ALPHABETIC KEYPUNCHING: EXERCISES 11 AND 12

The following two exercises contain abbreviations that are commonly used in data processing. These abbreviations should be memorized and used whenever possible.

General Instructions: 24, 26, and 29 Keypunches

1. Place cards in the hopper of the keypunch and turn on the main-line switch.
2. Raise the starwheels by means of the program control lever.
3. Keypunch the assignments. Place a blank column after each word. Keypunch the abbreviation and space; keypunch the complete word and space; and continue. After the first line has been keypunched, release the card and visually verify it for accuracy. If the card is accurate, keypunch the next line of data and continue until the assignment has been completed. If there is a keypunch error or errors, duplicate the card up to the card column in error, make the proper correction, and then duplicate the rest of the card.
4. Upon completion of the assignment, remove the error cards and with a pencil circle each card column in error. Keep all cards to turn in to the instructor.
5. Cover the vertical column containing the abbreviation with a blank card. This time punch the abbreviation but look at the full word and read down instead of across. Do not look at the full word unless absolutely necessary. The first card will contain the abbreviation for the word "apartment" and end with "crescent."
6. Continue the procedure until the exercise has been completed.
7. This exercise is to be practiced until all abbreviations have been learned.

Selectric Typewriter Instructions

1. Place the standard element on the Selectric.
2. Place the margin stops at 1 and 80.
3. Type the assignments. Place a blank column after each word. Type the abbreviation and space; type the word and space; and continue. After the first line has been typed, visually verify the card for accuracy. If the line contains no errors, return the carriage and type the next line. If there is a typing error, retype the line again until it is perfect. Then go on to the next line.
4. Upon completion of the assignment, circle each letter in error with a pencil. Keep the assignment to be turned in to the instructor.
5. Place a blank sheet of paper in the typewriter. Cover the vertical column containing the abbreviation with a blank card. This time type the abbreviation but look at the full word and read down instead of across. Do not look at the complete word unless absolutely necessary. The first line of typing will start

with the abbreviation for the word "apartment" and end with the abbreviation for the word "crescent."

6. Visually verify the exercise for accuracy. Circle any errors found.
7. On a separate sheet, retype each line that contains errors.
8. Be sure your name is on all papers to be turned in to the instructor.
9. This exercise is to be practiced until all abbreviations have been learned.
10. For additional practice turn to other exercises.

XERCISE 11

ommon Abbreviations Used in Data Processing

PT	APARTMENT	DR	DRIVE	HOSP	HOSPITAL	N	NORTH
VE	AVENUE	E	EAST	HTL	HOTEL	NE	NORTH EAST
CH	BEACH	EST	ESTATE	HRST	HURST	NW	NORTH WEST
LV	BOULEVARD	FL	FALL	INTL	INTERNATIONAL	ORCH	ORCHARD
RK	BROOK	FLD	FIELD	ISL	ISLAND	PK	PARK
LG	BUILDING	FRST	FOREST	JNCT	JUNCTION	PKVW	PARKVIEW
NYN	CANYON	FT	FORT	LK	LAKE	PKY	PARKWAY
TR	CENTER	GDN	GARDEN	LND	LAND	PKE	PIKE
NTL	CENTRAL	GEN DEL	GENERAL DELIVERY	LN	LANE	PL	PLACE
IR	CIRCLE	GRND	GRAND	LTTL	LITTLE	PNT	POINT
TY	CITY	GT	GREAT	LI	LONG ISLAND	PTE	POINTE
OL	COLLEGE	GRN	GREEN	MNR	MANOR	PT	PORT
ONCRSE	CONCOURSE	GRV	GROVE	MDW	MEADOW	PO	POST OFFICE
ONV	CONVENT	HRBR	HARBOR	MISSES	MISSES	PRRE	PRAIRIE
T	COURT	HTS	HEIGHTS	MESSRS	MISTERS	RFD	R F D
RK	CREEK	HWY	HIGHWAY	MT	MOUNT	RDG	RIDGE
RST	CRESCENT	HL	HILL	MTN	MOUNTAIN	RVR	RIVER

RD	ROAD	STA	STATION
RCK	ROCK	STRM	STREAM
RT	ROUTE	ST	STREET
RD	RURAL DELIVERY	TER	TERRACE
RR	RURAL ROUTE	TNSP	TOWNSHIP
ST	SAINT	TRL	TRAIL
SCH	SCHOOL	TPK	TURNPIKE
SHR	SHORE	UNIV	UNIVERSITY
6th	SIXTH, ETC.	VLY	VALLEY
S	SOUTH	VLG	VILLAGE
SE	SOUTH EAST	VLE	VILLE
SW	SOUTH WEST	WTR	WATER
SPG	SPRING	W	WEST
SQ	SQUARE	WD	WOOD

EXERCISE 12

State Abbreviations Used in Data Processing

Alabama	AL	Illinois	IL	Montana	MT	Rhode Island	RI
Alaska	AK	Indiana	IN	Nebraska	NB	South Carolina	SC
Arizona	AZ	Iowa	IA	Nevada	NV	South Dakota	SD
Arkansas	AR	Kansas	KS	New Hampshire	NH	Tennessee	TN
California	CA	Kentucky	KY	New Jersey	NJ	Texas	TX
Colorado	CO	Lousiana	LA	New Mexico	NM	Utah	UT
Connecticut	CT	Maine	ME	New York	NY	Vermont	VT
Delaware	DE	Maryland	MD	North Carolina	NC	Virginia	VA
District of Columbia	DC	Massachusetts	MA	North Dakota	ND	Washington	WA
Florida	FL	Michigan	MI	Ohio	OH	West Virginia	WV
Georgia	GA	Minnesota	MN	Oklahoma	OK	Wisconsin	WI
Hawaii	HI	Mississippi	MS	Oregon	OR	Wyoming	WY
Idaho	ID	Missouri	MO	Pennsylvania	PA		

Supplemental Keypunching Exercises

The following exercises may be used to gain further practice in the use of the keypunch.

SUPPLEMENTAL PRACTICE EXERCISE 1

This exercise is designed to give the student practice on each letter of the alphabet. Only those letters that are troublesome to the student may be practiced, or the entire exercise may be punched at one time.

General Instructions: 24, 26, and 29 Keypunches

1. Place a blank column between words as indicated.
2. New abbreviations of states should be punched while reading the exercise. The keypunch operator should be able to automatically keypunch the correct abbreviations at will.
3. Check each page of cards for accuracy before continuing, and correct each card in error.

Selectric Typewriter Instructions

1. Place the 1428 element on the typewriter.
2. Place margin stops at 1 and 80.
3. Type the exercise, placing a blank column between words. Use the new abbreviations for states whenever possible.
4. Check each page for accuracy and retype each line that contains an error.

PRACTICE EXERCISE

The Letter "A"

1. aa aid aaa all aaa alas aaa apart aaa salad aaa appeal aaa
2. area data aqua saga sway gala papa aria Alma Alan Adam Dan
3. alarm awake again arena amaze mania amass Alan Alamo Carla
4. adage adapt madam camera animal ballad banana Havana Amana
5. Alabaster Caverns, Oklahoma. Alamagordo, New Mexico
6. Alamosa, Colorado. Amana, Iowa. Arco, Idaho. Ash Lawn, N.C.
7. Mr. A. Aimes, 1164 E. Avalon Avenue, Arastoga, California
8. Mrs. A. Alamo, 24123 E. Alamomaga Avenue, Asmith, Arkansas

The Letter "B"

1. bbb bib fib ebb fbf blab fbf bride fbf blurb fbf bubble bbb
2. baby barb bomb bobs bulb ebbs boob bibs Babs Abbe Bobo Babe
3. abbot cabby Bible bulbs bobby nabob tubby Barby Abbey Debby
4. lobby hubby hobby rubber bobbin ribbon nibble babble Babbitt
5. Balanced Rock, Pennsylvania. Bald Mountain Caverns, Wyoming
6. Bandelier Nat. Mon., New Mexico. Berkshire Hills, Mass.
7. Mrs. Beatrice Bennington, Beebe Center, Branga, Georgia
8. Mr. and Mrs. Barth Beffington, 563 Betty Street, Baggton, N.M.

The Letter "C"

1. ccc can dcd cue dcd corn dcd clock dcd click dcd clinic ccc
2. come acme nice each acid face scar city deck echo came Coca
3. comic check crick cache coach crack civic cycle Chick Chuck
4. occur occupy critic accent accord acceded accuses succeeded
5. Cannon Beach, Oregon. Carlsbad Caverns National Park, N.M.
6. Carmel-by-the-Sea, Calif. Carpenterville, Colo. Oregon City, Ore.
7. Mr. C. J. Carruthers, 467345 Castaway Ave., Centerville, Calif.
8. Mr. and Mrs. Callaway Catherton, Cucamonga, Calif. 90745

The Letter "D"

1. ddd did ddd dye ddd dude ddd dried ddd idled ddd muddle ddd
2. died deed odds dyed duds dead adds idea lady done Dody Dude
3. dozed dodge dread dandy faded aided ended ceded David Daddy
4. toddy caddy added middle ladder adding beeded bidder kidded
5. Death Valley Nat. Mon., Calif. Duck Rock, Fla. Dallas, Tex.
6. Dunndell Gardens, S. C. Dyersville, Calif. Desert Inn, Nev.
7. Mr. Duddington Dillway, 222 W. Dunnaway St., Dover, Delaware
8. Doctor and Mrs. Dexter Dixon, Dakota Junction, North Dakota

The Letter "E"

1. eee end ded eye ded heed ded elves ded tense ded eleven eee
2. else jeep even ever meet need edge eyes feel week Erne Edie
3. level erred elite every elect exert eager defer refer scene
4. eerie three agree coffee fegree decree speedy sleepy freeze
5. Eureka, Calif. Eagle Harbor, Mich. Empress Hotels, Victoria
6. Erie, Pennsylvania. Eagle Rock, N. J. Elko, Nev. Ely, Minn.
7. Edward and Ester Elwell, 671 East Eddington Ave. Exterville
8. Everett Evans and Ellen Egar, Engaged. Elliottsville, Ind.

The Letter "F"

1. fff for fff off fff buff fff fifth fff fifty fff affair fff
2. biff doff tiff tuff cuff fife safe left file life Fifi Effy
3. stuff bluff stall affix stiff taffy affix forth Duffy Cliff
4. fluff muffs offer office differ suffer effort baffle tariff
5. Feather River Canyon, Calif. Fairless, Pa. Flagstaff, Ariz.
6. Fargo, North Dakota. Fishlake Forest, Utah. Franklin, N. H.
7. Mrs. Florence Faye Flamingo, Flower Child, Flowerpot Street
8. Madame Faith Farrington, 222 Farmer Way, Fallmouth, Florida

The Letter "G"

1. ggg got fgf log fgf gong fgf going fgf soggy fgf groggy ggg
2. gleg gang grog eggs gags agog gage rigs grig Gigi Gale Glen
3. gorge aging gauge gouge Gregg grudge George granges eggnogs
4. foggy beggar juggle bigger baggage sagging suggest giggling
5. Gaddy's Goose Refuge. Green Bay, Wis. Grand Mesa Park, Colo.
6. Grasshopper Glacier, Mont. Great Salt Lake, Utah. Green Bay.
7. His Excellency, G. G. Galveston, Governor. Gallup, New Mexico
8. Senator George Greggs, Galveston County, Georgia. Box 1246

The Letter "H"

1. hhh hot jhj the jhj high jhj which jhj hunch jhj higher hhh
2. shah hash hath hush high then what both thus with Hugh Hahn
3. hatch thigh shush harsh check might other shall Heath Helen
4. hah though hurrahs highly highest rhythms withhold withheld
5. Hamburg, N. J. Hanford, Washington. Hershey, Penn. Halifax
6. Hollywood, Calif. Hiawatha Valley. Hoover Dam. Hot Springs
7. His Lordship, Hanford Heartburn at 61126 Hurt Rd. New York
8. Honorable Hestor Hunnington Rt 1 Hope's Hill, Hoper, Calif

The Letter "I"

1. iii ink kik did kik Mimi kik visit kik mimic kik liquid iii
2. into city idea give iron fair hair wait inch itch Iris Mimi
3. civic livid limit idiom vivid finis icing Miami India Dixie
4. invite critic icicle divided hiring inhibit initial division
5. Illinois. Imperial Valley. Independence Rock. Island Beach
6. International Peace Garden. Interstate Park. Inyo-Mono, Calif.
7. Mr. and Mrs. Ira Iazze, 112121 Inez Street, Box 12, Idaho
8. Intimate International Inca Organization. Hammonasset, Ind.

The Letter "J"

1. jjj job joy jjj just jjj major jjj jewel jjj jjj justly jjj
2. jobs join jugs ajar joys jury jade joke jail July John Jojo
3. joint judge jelly jolly enjoy juice joker Jacob James Jerry
4. jumbo jurors juster unjust adjourn journal jackets juvenile
5. Jackson Lake, Wyoming. Jefferson City, Missouri. Jay, N.Y.
6. Jenny Lake, Wyoming. Jewel Cave National Monument, S.D.
7. Mr. and Mrs. Jasper Jenkins, 63441 Rock Street, Juneau, Alaska
8. Judge and Mrs. Jenson Johnson, 6240 Plenty Street, Jacksonville

The Letter "K"

1. kkk key kkk eke kkk kick kkk knack kkk knick kkk knocks kkk
2. kirk keys kink milk kiln junk like bake know keen Karl Kent
3. kyack knock kulak khaki kinky kapok kayak Kathy Karen Kodak
4. knife kicker kicked Keokuk minikin knock knuckle kickback
5. Kaniksu National Forest Idaho. Ketchikan, Alaska. Kane, Pa.
6. Kings Mountain National Military Park, S.C. Kanab, Utah
7. Mr. and Mrs. Kniver Kelly, 67481 Keynote Ave., Kentucky, Kansas
8. Kingsman Kenny K. Kruger, 64289 Kallin Ave., Kenya, Kansas

The Letter "L"

1. lll lay lll all lll will lll level lll allot lll little lll
2. lull lilt loll lily fell bill sell mill well Lyle Lola Lila
3. alley local lilac legal label libel lowly ladle Lloyd Laila
4. wills rolls shall knolls balled billed collar dollar allows
5. Letchworth State Park, New York. Limpia Canyon, Texas
6. La Malbaie, Quebec. Lake Arrowhead, California. Labelle, Que.
7. Mr. and Mrs, Lonnie Loveless, 2491 Lost Lake Ave., La Sal, La.
8. Mr. and Mrs. Larry Lariano, 333333 Lawrence Lane, Lincoln, Mo.

The Letter "M"

1. mmm map jmj jam jmj maim jmj mimic jmj madam jmj moment mmm
2. moms mums mama item memo many same much from army Mimi Emma
3. memos maxim manor month mummy mumps mamma comma Mammy Mamie
4. commit common summer immune member mammal mammoth immensely
5. Mr. Desert Island, Me. Mt. Diablo, Calif. Mt. Marcy, N.Y.
6. Mt. Mazamar, Oregon. Monongahela Nat. For., W. Va. Manteo, N.C.
7. Madamoiselle Marie Montezuma, Marage Mountain, Mexico
8. Mrs. Mildred M. Mockingbird, 6887 Humming Way, Modoc, Miss.

The Letter "N"

1. nnn nay nnn winnow jnj nag nine anent inner jnj nine nnn
2. noun Nina none inns nuns Anne noon neon Nona only anon name
3. annex ninth linen onion union nylon unpin nouns Ronny Nonny
4. ninny minnow annual cannot manners canning connect annually
5. North Tarrytown, N.Y., Northcumberland, P. Niclet Nat. For., Wis.
6. Nesperce Nat. For., Idaho. Natchez, Miss., Newport News, Va.
7. Narasscus N. Nothenhale, 4538 N. Neely St., Norwalk, N.C.
8. Mr. and Mrs. Nick N. Nickles, 4436 Notingham Lane, Nantucket, Neb.

The Letter "O"

1. ooo oak lol own lol odor lol motor lol moron lol follow ooo
2. door Olny oboe Olaf cool ooze took moon foot oleo onto polo
3. rotor ozone solos odors polio color moose proof roost scoop
4. cooks cooler floors smooth cookies foolish footing lookouts
5. Okabaji Lakes, Iowa, Old Faithful Geyser, Wyo., Old Newgate, Conn.
6. Otter Crest State Park, Oregon. Old Sturbridge, Mass., Orlando, Fla.
7. Omnipotent Olive Osgood, 6438 Old Town Road, Osawatomie, Kansas
8. Dr. and Mrs. Osgood Oxsley, 2467 Oslow Way, Otter Creek, Ore.

The Letter "P"

1. ppp pay ;p; pen ;p; prop ;p; upper ;p; paper ;p; prompt ppp
2. peep pope pups plop pipe pulp upon play keep copy Paul Pepe
3. puppy piped plump pupil poppy pipes apply peppy sappy Happy
4. apple peppy happy apply pepper zipper happen snappy support
5. Pointed Rock, Minn. Paducah, Kentucky. Persimmon Gap, Tex.
6. Pere Marquette State Park, Ill. Peroskey, Mich. Pratt, Kansas
7. Senior Papa Peperoni, 6782 Pizzi Ave, Pecos Pueblo, Penn.
8. Prince Pendleton Pawtucket, 602 Plymouth Blvd, Pikes Peak, Colo.

The Letter "Q"

1. qqq que aqa qui aqa quit aqa quell aqa queen aqa quoits qqq
2. quod quad quen quid aqua quip quay quiz quey Quin Quee Quen
3. quail query pique quilt quite equip quake equal quote Queen
4. qualm quaint unique apaque quarter banquet quality acquaint
5. Quincy, Massachusetts. Quoddy Village, Maryland. Quebec, Que.
6. Auilloyut Indian Reservation, Illinois. Quetico Province, Ont.
7. Sir Quenton Quodrangle, 62455, Quill Road, Quabbin Village, Colo.
8. Queen Saddle Back 82461 Quarter Horse Blvd, Quebec, Que.

The Letter "R"

1. rrr ray frf rug frf roar frf error frf carry frf repair rrr
2. roar rear errs rate purr burr were over four real Ruth Rory
3. rover refer recur error arrow brier drier prior order Perry
4. marry barrel terror arrive carrier berries arrange corridor
5. Rapid City, South Dakota. Red Wing, Minn. Rehoboth Beach, Del.
6. Reno Ski Bowl, Nevada. Rhinelander, Wis. Rum Pork Road, Colo.
7. Sir Reginald Runningboard, 2425 Rappahannock Road, Racine, Wis.
8. Gen. Ronnie Reelfoot, 6211 Wildroot Road, Rockfield, Utah

The Letter "S"

1. sss sue sws sis sws loss sws sales sws issue sws system sss
2. loss less sues uses sits sash sees sirs says miss Tess Bess
3. sales socks loses slash sense suits sizes guess asset Susan
4. issue stress bosses assets assists success sissies sustains
5. Saddle River, New Jersey. Saguarro Nat'l Mon., Arizona.
6. St. Gaudens Memorial, N. H. St. Joe Nat'l For., Idaho.
7. Mr. Shotgun Sherry, 6224 S. Bottle Road, Sacramento, Calif.
8. Saint Augustine Savannah, 6612 Sawtooth Circle, Skytop, Pa.

The Letter "T"

1. ttt tip ftf tot ftf mutt ftf title ftf total ftf static ttt
2. tots mutt that trot toot tote tent tact tots test Etta Toby
3. total truth trout trait taste teeth title tooth Dotty Lotty
4. ditto totter tatter attain stutter fitting letters attempts
5. Tempanogos Cave Nat'l Mon., Utah. Tullytown, Pa. Trap Pond
6. Taughannock Falls, N. Y. Taneycomo Lake, Mo. Tamiami Trail
7. Tacoma T. Tazewell, 62 Tahoe Mountain Rd., Teapot Dome, Wyo.
8. Titus T. Tucker, 75 Toolieville Rd. Turtle Mountain, N. D.

The Letter "U"

1. uuu use jum ups juj dual juj usual juj usury juj unused uuu
2. used unto upon your unit much four sure hour user Ulla Judy
3. usual usury usurp issue truly would about could Trudy Rudie
4. undue unused unless unduly unusual uncouth mutuals usefully
5. Upper Klamath Lake, Ore. Uinta Mountains, Utah. Upton, Me.
6. Uniontown, Pa. Upper Hot Spring, Alta, Utah, Utica, Ill.
7. Uncle Ulysses Upstart, 6768 Urbanea Underpass, Uinta, Utah
8. Mr. Ubangi Unitas, 8462 Underground Ave., Ute Pass, Colorado

The Letter "V"

1. vvv vow fvf vie fvf view fvf vivid fvf valve fvf velvet vvv
2. void even very ever gave veil vote have vows five Vera Veda
3. vista vague verve every never visit halve heavy Verna Vicky
4. value vivers Vivian valves visited revival vividly vivified
5. Valentine, Nev. Van Buren, Mo. Virgin River, Utah. Visalia
6. Virginia Beach, Va. Vally of Fire State Port, Nev. Vinion
7. Miss Vira V. Venus, 77 N. Vinelander Street, Visalia, Calif
8. Queen Victoria Van Vootes, 182½ N. Vanda Road, Vixburg, Va.

The Letter "W"

1. www why sws two sws wavy sws which sws would sws wigwam www
2. wary week wows whew away when with what owes wish Will Owen
3. whoop where wharf swish allow while renew worth Wally Wayne
4. widow warble window wallow willows wayward awkward withdraw
5. Wichita Mts. Wildlife Refuge, Okla. Weekiwache Springs, Fla.
6. Wonalancet, N. H. Wiscasset, Me. Winnebago Ind. Reservation
7. Widow Winnie Willowby, 12 Weeping Willow Lane, Walla Walla, Wash.
8. Chief Wyandotte Wahos, 28949 Woodruff Ave., Wenatchee, Wash.

The Letter "X"

1. xxx six sxs box sxs next sxs taxes sxs index sxs extras xxx
2. flex taxi axis foxy axle oxen exit text axes exam Alex Axel
3. maxim sixes extra exact sixty vexed waxed Maxie Dixie Xerox
4. proxy oxygen deluxe reflex expense examine expects exercise
5. Xanthippe, Xanthophyll, Xavier University, Xmas Tree Lane.
6. St. Francis Xavier, Xenophon, Xerography, Xerophyte.
7. Senior Xavier Taxwell, 624 Exit Drive. Chatex Matex, Calif.
8. Xerox X. Axehandle, 672 Xray Aven, Xerxes Canyon, Lexington

The Letter "Y"

1. yyy you jyj yet jyj year jyj yearn jyj yards jyj heyday yyy
2. yawn your type many days yard duly city duty easy Yule Yale
3. youth dryly shyly slyly mayor study style yield Young Royal
4. windy mayfly typing yearly pyramid tyrants loyalty synonyms
5. Yellowstone Nat. Park, Calif. Yucca Valley, Calif. Yaquina.
6. Yakima Indian Reservation, Wash. Yorktown, Me. Yuma, Ariz.
7. Yami Y. Young, 3218 Yellowknife Ave. Yaquina Bay, Wyoming
8. Yolondra Yaleburg, 6215 Yorktown Ave. Yosemite Nat. Park

The Letter "Z"

1. zzz zip aza zoo aza zone aza zeros aza azure aza zigzag zzz
2. zinc zero razz hazy doze zoom size quiz jazz lazy Zola Zona
3. zebra ozone amaze fizzy dozen dozed razor prize Dazzy Lizzy
4. dizzy sizzle puzzle muzzle citizen realize dazzled quizzing

5. Zion Canyon Nat. Park, Utah. Zuni Pueblo, N. M. Zebra Mt.
6. Zeldabeade Indian Reservation. Suzumi, Zailburg Canyon

7. Mr. Zeke Zebra, 61583 Zercon Blvd. Zuni Pueblo, New Mexico
8. Mrs. Zion Z. Zifferman, 77727½ Zinnia Zelda, Flowerpot, Ariz.

SUPPLEMENTAL PRACTICE EXERCISE 2

This exercise is designed to give the student practice in the use of each finger on both hands.

These exercises that appear troublesome or awkward to the student may be practiced, or the entire exercise can be punched at one time.

General Instructions: 24, 26, and 29 Keypunches

1. **Place blank columns between the words or letters as indicated.**
2. **Check each card for accuracy and rekeypunch any card containing errors.**

Selectric Typewriter Instructions

1. **Set margin stops at 1 and 80.**
2. **Type the exercise, placing a blank column between words or letters where indicated.**
3. **Check each page for accuracy and retype each line that contains an error.**

PRACTICE EXERCISE

Finger Drills

First Fingers

1. Average batter homonym great joy noun verb rag lymph minion
2. brag fat minimum hominy taffeta after union hum target human

3. jumpy barge beg bag phony join mum grab ump puny graft grate
4. pylon opinion Honolulu vegetate tattered abaft unholy treat

5. unhook yum tag carts beggar phylon nylon hilly baggage drab
6. avert Johnny onion him regrets raft mummy garter bat my oh

Second Fingers

7. million Kokomo kinky seceded cadet mink in wed deed decade
8. accede creed kin cascade minikin milk seed kiln are kimono

9. wedge kink ace milky pink ink cedar edge fed link to dead
10. decrease junk kink dread pinkily exceed pipkin weeds ilk

11. debt popin ceased ceded receded pinky inky Niki in him nylon
12. wedded unhilly Phyllis deceased deeded Phillip hook teased

Third Fingers

1. westward sweets vexes knoll swab loll was poplin pompom oil
2. excesses ill Joplin sew assets poll you'll saws waxes jolly

3. swear sax polo waste sex look west loony lop awes Polly nil
4. exceeded monopoly waxweed lollipop holly excess Molly straw

5. look phono Milly hilly Philly few axe test grasses stressed
6. OK swagger Warsaw null sweat base Honolulu Tex onion only

Fourth Fingers

7. savages pup pumpkin zag bazaar pulp pippin raze dazed plump
8. Barbara pop are pillion strata upon area puppy craze pupil

9. zebra adze nip mopy tax nippy poppy zed pump mop award data
10. imp pill phony Aga gaze adaze hop limp pomp Ada daze aware

11. bazaars pun zagged pull radar pool acre lumpy Art jumpy
12. affairs crazed wages axle age hominy limply imply punk pip

13. Miss Linda Lou Lilly, 146 Lovers Lane, Long Leap Island, La.
14. Rev. and Mrs. Leon Litmus, 29385 Lollipop Lane, Larson, La.

One Hand

1. deded lolol swsws pppp aqaqa kikik frfrf jujuj ftftf jyjyj
2. our owe put eye pup wet out eye try tip yet you ewe row two
3. pert your pipe tire quit were pour true tout port quay trip

4. write queue quire piper quoit equip quiet wrote power quite
5. too weep root troop rout poor weep queer poor top queer top
6. aft cab cat sag ago wag eat oh, put lug one ohm are war ate

7. army puff cart once pits page sort route pity pest able cafe
8. worry dough cough laugh smash pithy spout water poppy purse
9. not tap bay gay cup now how mob mow ban nor tan van tax how

10. ripe take trip tame dupe tank gale game yore whip nope fuzz
11. honor throw whole gaudy quite upper short croup think trips

Names

12. Helen Pawlowski, William J. Mulvihill, Andrea G. Mohrmann
13. Vivian Salcido, Francis Rash, Olive A. Melville, Jennie Rix
14. Marie Miller, Elizabeth Ramsay, Manuel Mora, Vivian Salcido

15. Luise Rannersberger, Audrey S. Ryland, Mary W. Shadid, what
16. John M. Moses, Acisclo Morales, Everett D. Parker, Jose Soo
17. Blanche I. Schuh, Leonard Senk, Jacky Humberger, Juan Soria

18. Craddie M. Riggs, Andrea Moudy, Guy Drake Nevills, Tim Trip
19. Botswana, Lesotho, Tanzania, Kenya, Peru, North America, go
20. Brazil, Chile, The Amazon, The Nile, Egypt, Colombia, Kenya

Home Row

1. gag sag sad all dad Ada has ash lag lad gas fad had jag ask
2. saga fall half shag hall lash flag alas sash gala dash glad
3. slags halls Allen slash salad flags shall flash glass flask
4. sass lass add hash adds all dash glade dash glad shall gall
5. has half saga lash fall alas had flag glass sash glare gala

Lower Row of Keys

1. azaza dcdcd fvfvf fbfbf jnjnj fbfbf jmjmj kkkkk fvfvf dcdcd
2. axe nab Ben Nan Von ban bib can cab man van mix box non zax
3. axiom venom maxi venom comma comb back bomb zinc buzz numb
4. fix, fox, cob, nob, sob, nab, mob, lag, jab, gab, dab, cab

1. Acisclo Morales, Blanche I. Schuh, Verchie S. Moudy, Joe Soo
2. Craddie M. Riggs, Louise E. Rannersberger, Francis Rash, to
3. Leonard Senk, Charity Smith, David E. Neville, Jennie Rix

Double-Letter Drills

Doubles in Words

1. need less been eggs ebbs burr tool well soon keep look fill
2. feel sees toss seem will book ball miss mill pass good pool
3. buss mitt cuff putt miff mutt full wall door hood food ooze
4. cliff putty drill class flood breed asset nilly witty offer
5. seeks added skill green goods dizzy guess radii small proof
6. gummy apple ditto rummy abbey fluff shall sleep upper petty
7. broom gloss essay speed floor issue happy funny staff occur
8. jobber arrive common beggar robber all errors commas bigger
9. fiddle supper snooze letter middle see puppet sooth little
10. effect happen bottle gummed bubble zoo middle bullet agreed

11. annoys accord sizzle issues dinner off muffle keeper puzzle
12. withheld withhold quitters succeeds vacuums powwows grammar
13. slowness carriage followed possible shopper blabber flivver
14. occasions bookkeeper typewritten accused dazzling efficient
15. beginning assistants unnecessary cabbage borrowed excellent

Names

16. John G. Kneeland, Minnie H. Lund, Ann C. Marquardt, Joe Soo
17. Minnie Hepler, Paul M. Howe, Patricia K. Kastorff, Jud Ruby
18. Peter A. Klotz, John D. Hopson, Cordelia L. Lacey, Ollie Ny
19. Helen W. Martinson, Vernita J. Jordan, Victoria Lopez, L.M.

First Row
up to
Third

1. not nut bow cry vie mop now may bit cue cur cut but vet cow
2. more note very crow bout crop veer boot mutt core zero view
3. venom amber vixen liver berry merry crane moors cramp berth

4. Elizabeth Ramsay, Becky Botswana, Lucy Lesotho, Vivian Vate

Third Row
down to
First

5. ton yon own urn pun pin run Tim Rex win won tub rim rib yen
6. prom town worm open upon iron Robb quiz ruin poem turn item
7. round perch toxin queen preen Rowyn Erron preem towns upon

8. Guy Drake Nevills, Ann Armarillo, Andy Azol, Craddie Riggs,

9. frame free fray frap fro fr fry from frog fret fraud French
10. chuck hunt huff hung hug hu hut huge hill hurt shuts chunks
11. agree gram grub grow gri gr gro grin grab grip grass grocer

12. tinny Tony zany many any ny any many tiny deny rainy anyhow
13. arbor Barb herb barb orb rb arb orbs garb curb blurb absorb
14. mums music much mums must mud mu muff mush mucle music much

15. brace brad brag bran bro br brog brew bray brat brain begs
16. nurse nuns numb null nub nu nut Nunn gnus nubs nutty annual

PROGRAM CARD PREPARATION AND USE: EXERCISES 1–6

The following exercises are designed to aid the student in planning, coding, and using program cards.

General Instructions: 24, 26, and 29 Keypunches

1. Using a blank card and a pencil, design a program card to punch the data specifications on each of the following exercises.
2. From the planning card prepared from step 1, punch the program card required to actually keypunch the exercise.
3. Place the program card on the program drum, lower the starwheels, turn on the auto feed switch and print switch, and feed two cards.
4. Keypunch the first card and visually verify. Turn on the auto skip dup switch and complete the assignment.
5. Visually verify the remaining cards and rekeypunch all cards that contain errors.
6. Time yourself and keypunch the assignment again.
7. Use the accompanying chart to calculate your punching speed measured in keystrokes per hour. Record the time and speed in your notebook and also on a separate card to be turned in to the instructor.
8. Visually verify and rekeypunch any cards containing errors.
9. Turn in all cards to the instructor.

Selectric Typewriter Instructions

1. Set the margin stops at 1 and 80.
2. Place a blank sheet of paper in the typewriter and be sure the 1428 typing element is in place.

3. Type the following exercises. It will be necessary to set the tab stops in order to tabulate over any alphabetic fields or fields designed to be skipped. Upon completion of each line, visually verify and make any necessary corrections by retyping the entire line.
4. Time yourself and retype the assignment but go straight through and do not stop after each card to verify.
5. Use the accompanying chart to find your punching speed measured in keystrokes per hour. Record the figures in your notebook and also at the bottom of the assignment to be turned in to your instructor.
6. Visually verify the exercises and retype any line containing an error.

Estimating Your Keypunching Speed

Approximate Number of Keystrokes Per Exercise	Keystrokes Per Hour	Time in Minutes
	Exercise 1	
700	2,000	21
	3,000	14
	4,000	10½
	6,000	7
	8,000	5
	10,000	4
	12,000	3½
	Exercises 2 and 4	
600	2,000	18
	4,000	9
	6,000	6
	8,000	4½
	10,000	3½
	12,000	3
	Exercises 3, 5, and 6	
500	2,000	15
	4,000	7½
	6,000	5
	8,000	4
	10,000	3
	12,000	2½

EXERCISE 1

Specification:

Card Column	
1–6	Student number (last column will be alpha)
7–31	Course title (alpha)
32–35	Course number
36–40	Class number
41–44	Department number (dup)
45	Hours
46–69	Student name (alpha)
78–79	Grade number
80	Student code (alpha)

1–6	7–31	32–35	36–40	41–44	45	46–69	78–79	80
Student Number	**Course Title**	**Course Number**	**Class Number**	**Dept. Number**	**Hour**	**Student Name**	**Grade Number**	**Student Code**
87906A	DATA PROCESS.	7634	97531	1068	7	JOHNSON, WILLIAM	81	J
75689B	BOOKKEEPING	5704	78654	3542	7	SMITH, MARYANN	64	S
83824H	BUSINESS	9874	34867	2033	8	ARNOLD, PAUL	40	A
70890N	KEY PUNCH	8756	12308	4286	9	BRIGHT, BETTY	76	B
68570C	HISTORY	9049	67491	0798	7	CARLTON, THOMAS	56	C
12367X	ENGLISH	7878	34786	0012	9	CONNER, FRED	87	C
70956K	SPEECH	6757	23498	7070	9	ISAAC, JACK	13	I
09876T	BUSINESS MATH	7856	45365	4563	8	IRWIN, STANLEY	45	I
75634R	MACHINES	9850	36759	6875	9	KRAVITSKY, JULIUS	68	K
45891W	DRAWING II	8762	54540	2309	7	ROONEY, HARRY	91	R

EXERCISE 2

Specification:

Card Column	
1–8	Tag number (last column will be alpha)
9–13	Account number
18–22	Quantity
23–30	Amount
45–50	Date (dup)
51–59	Purchase order
60–76	Vendor's name
77–80	Current date (month and day)

1–8	9–13	18–22	23–30	45–50	51–59	60–76	77–80
Tag Number	**Account Number**	**Quantity**	**Amount**	**Date**	**Purchase Order**	**Vendor's Name**	**Current Date**
7860943A	75972	00024	000540.70	091070	976511578	WILFRED, GODFREY	0812
9865002T	87307	00300	000900.78	091070	976110054	ANDREW, JOHN	0905
7594608R	52119	00019	000067.00	091070	111453379	MONSEN, ARVID	0906
7945009K	67511	00210	000345.90	091070	989966001	SMITH, ROBERT	1109
5674388P	56731	00054	000104.00	091070	768490012	INGRAHAM, FRANK	1110
7645998S	89898	00105	000200.00	091070	674589021	COWAN, KENNETH	0711
2347895D	54761	00078	000175.85	091070	987667893	CLONEY, WILLIAM	1115
5670956J	11223	00230	000414.00	091070	090657411	JOHNSON, FRANKLIN	1205
0987890Z	56098	00025	000050.00	091070	987511004	SEYBOLT, GEORGE	1207
7654562L	87613	00415	000090.98	091070	007423579	WILLIAMS, PETER	1230

EXERCISE 3

Specification: Card Column

1–6	Check number—left zero's print
7–26	Name
27–37	City
38–42	State (duplicate)
50–55	Date (duplicate month and year only)
65–69	Amount

1–6 Check Number	7–26 Name	27–37 City	38–42 State	50–55 Date	65–69 Amount	70–80 X
7589	FREDERICK, ROBERT	LAKEWOOD	CALIF	041067	56.00	
864	MEEKS, BOB	LONG BEACH	CALIF	041467	145.00	
1090	MYERS, FLOYD	BELLFLOWER	CALIF	041667	70.00	
45	HODGE, PAUL	PARAMOUNT	CALIF	042067	35.00	
490	GOFF, DARRELL	DOWNEY	CALIF	042167	265.00	
24	GUIDA, DANNY	LAKEWOOD	CALIF	042567	9.98	
18	BARTLEY, EDWARD	NORWALK	CALIF	042867	80.80	
6785	DEMPSEY, HERBERT	LONG BEACH	CALIF	042967	75.25	
98401	LEONI, ALLEN	ORANGE	CALIF	043067	123.89	
690	HALLIDAY, LINDA	PARAMOUNT	CALIF	043067	300.78	

EXERCISE 4

Specification: Card Column

1–6	Check date (duplicate year only)
12–15	Check number
16–40	Name of payee
46–50	Amount
55–70	Bank name
75–80	Current date (duplicate year only)

1–6 Check Date	12–15 Check Number	16–40 Name of Payee	46–50 Amount	55–70 Bank Name	75–80 Current Date
030967	2356	HANSON, SUSAN	087.90	FIRST NATIONAL	061068
031167	7645	SCOTT, SYLVIA	090.00	FEDERAL SAVINGS	061868
042167	9856	GARRISON, KENNETH	145.40	FIRST WESTERN	092568
050767	4523	ROONES, BOB	175.00	FIRST NATIONAL	092868
050967	6745	POTTER, TOM	230.50	FIRST WESTERN	100268
072367	8007	HUGHES, MARTIN	16.00	FEDERAL SAVINGS	100668
072467	8009	ANDERSON, EDWIN	43.87	HOME SAVINGS	102468
100967	6731	HARTLEY, DEBBIE	66.65	FIDELITY	111968
102467	1816	HIGGINS, HENRY	303.00	BANK AMERICA	112068
113067	8611	MCCORMICK, JOSEPH	212.20	SAN FRANCISCO	122968

EXERCISE 5

Specification:

Card Column	
1–3	School number
10–25	Location (alpha)
27–35	Serial number
38–45	Date
55–61	Phone number
65–69	Invoice number
73–75	Items (numeric)
77–79	Item by code (alpha)

1–3	10–25	27–35	38–45	55–61	65–69	73–75	77–79	80
School Number	**Location**	**Serial Number**	**Date**	**Phone Number**	**Invoice Number**	**Item**	**Item Code**	**X**
789	DE MILLE	415456120	06-15-65	9276096	36241	104	ABC	
586	LINDBERGH	786540978	06-23-65	8679775	83620	26	BCF	
411	MILLIKAN	456119876	06-25-65	4214580	43689	3	GAB	
871	LAKEWOOD	456681189	07-04-66	4267589	16231	264	LAC	
830	AVALON	564789125	07-19-66	8697460	98743	59	DEF	
764	BANCROFT	761190856	10-20-66	8675980	28623	300	BOG	
597	LONGFELLOW	546781190	11-25-66	4386549	46809	150	LBR	
543	JORDON	567489076	08-06-67	8769458	67540	756	KLH	
984	WILSON	765234901	08-11-67	8675409	52110	98	IJK	
974	POLY	768905437	09-28-67	4257890	87615	9	THR	

EXERCISE 6

Specification:

Card Column	
1–8	Number Column 8 alpha Columns 1–7 left zero print
14–18	Account number
23–27	Quantity
33–38	Amount (print suppress amount)
46–51	Current date (dup)
52–70	Name
78–80	Your initials (first, middle, last)

1–8	14–18	23–27	33–38	46–51	52–70	78–80
Number	**Account Number**	**Quantity**	**Amount**	**Current Date**	**Name**	**Initials**
98745K	76543	00342	98.00	081567	COTTLE, JAMES	JMC
4590D	98561	00076	180.90	081567	HOLLEMAN, RONALD	RDH
47A	67450	00211	79.00	081567	WHITE, BILL	BIW
0089674J	65231	00098	240.00	081567	PACKARD, JEFF	JAP
5118G	23211	00460	90.00	081567	JAMES, RICHARD	RAJ
78112C	08614	00009	376.98	081567	ZIMMERDAHL, STEVE	SPZ
89T	45367	00075	211.00	081567	WITT, DIANE	DMW
6173M	98457	00250	65.50	081567	MCMURRAY, CHUCK	CRM
7171000F	56897	00780	44.00	081567	COOPER, SHARON	SFC
6591P	11994	00065	300.00	081567	VALLES, DALE	DTV

THE JOB INSTRUCTION SHEET: EXERCISE 1

The following exercise is designed to familiarize the student with the job instruction sheet. Program cards are to be coded and punched from the information contained on the instruction sheet. The prepared program cards are then to be utilized in the punching of the exercise.

The numeric portions of the exercise may be used as an additional numeric drill on the Selectric typewriter.

General Instructions: 24, 26, and 29 Keypunches

1. Using a blank card and a pencil, design a program card to punch the data specifications contained on the job instruction sheet.
2. From the planning card prepared from step 1, punch the program card.
3. Keypunch each page of the exercise without stopping. Time yourself on each page so that you may check your speed.
4. Visually verify the accuracy of your cards, or verify them on a 56 or 59 verifier.
5. Rekeypunch the cards containing errors and turn in all cards to the instructor.
6. Record your time and speed from the accompanying chart in your notebook and also on a separate card to be turned in to your instructor.

Selectric Typewriter Instructions

1. Set margin stops at 1 and 80.
2. Place a blank sheet of paper in the typewriter and be sure the 1428 typing element is in place.
3. Set the tab stops to tabulate over alphabetic fields or fields designed to be skipped.
4. Type the exercise. Upon completion of each line visually verify and make any necessary corrections by retyping the entire line.
5. Time yourself and retype the assignment going straight through and not stopping after each line to verify.
6. Use the accompanying chart to find your punching speed measured in keystrokes per hour. Record the figures in your notebook and also at the bottom of the assignment to be turned in to your instructor.
7. Visually verify the exercises and retype any line containing an error.

Estimating Your Keypunching Speed

Number of Keystrokes Per Page of Exercise	Time Required to Keypunch One Page of Exercise in Minutes	Keystroke Speed in Keystrokes Per Hour
1,040	21	3,000
	15½	4,000
	12½	5,000
	10½	6,000
	7½	8,000
	6	10,000
	5	12,000

IBM®

INTERNATIONAL BUSINESS MACHINES CORPORATION

CARD PUNCHING OR VERIFYING INSTRUCTIONS

Form X24-6299-2
Printed in U. S. A.

JOB NAME	JOB NO.	CONTROL PANEL. NO.	OPERATION NAME	OP. CODE	MACH. TYPE
Plant and Equipment Record	PER-1-6		Keypunch	31	26 29

FREQUENCY
☐ DAILY
☐ WEEKLY
☐ BI-WEEKLY
☐ SEMI-MONTHLY
☐ MONTHLY
☒ QUARTERLY
☐ ANNUAL
☐ OTHER

DUE IN		DUE OUT		ESTIMATED VOLUME	EST. TIME	
TIME	DATE	TIME	DATE		HOURS	TENTHS
				100	0	8

PROGRAM CARD NO.

CARD ELECTRO (FORM) NO. 5081

SWITCH SETTINGS - ON
☒ PROGRAM UNIT
☒ PRINT
1 2
☐☐ PROGRAM SELECT
☒ LEFT ZERO PRINT
☒ AUTO FEED
CK PCH
☐☐ SELF CHECK NO.
☒ AUTO SKIP-AUTO DUPL (VER)
INS ST
☐☐ CARD INSERT

SPECIAL FEATURES USED
☐ CARD CORRECTION
☐ AUXILIARY DUPLICATE (VERIFY)
☐ CARD INSERTION
☐ SELF CHECK NO.
☐ AUTO LEFT ZERO
☐ SELF CHECK NO. GENERATOR
☐ ALTERNATE PROGRAM
☐ VARIABLE LENGTH FEED
☐ HI SPEED SKIP
☐ INTERSPERSED GANG PUNCH

SOURCE DOCUMENTS USED: Plant and Equipment Record

DISPOSITION OF CARDS: to verifier

RECEIVED FROM: Accounting Dept.

DOCUMENTS to verifier

CARD FIELD	COLUMNS FROM	COLUMNS TO	FUNCTION*	REMARKS
1. Location - Plant, Bldg., Floor, Dept.	1	4	DV	
2. Item Number	5	9	PV	Last digit may be alpha
3. Acct	10		PV	
4. Class	11		PV	
5. Type	12	14	PV	
6. Description	15	39	P	
7. Acquisition Date	40	43	PLZV	
8. Expiration Date	44	47	PLZV	
9. Total Installed Cost	48	55	PV	
10. Periodic Depreciation	56	62	PV	
11. Factor Value	63	69	PV	
12. Control Punch	70		DV	11 Zone Punch
13. Columns 71 - 80	71	80	S	
14.				
15.				
TOTAL KEY STROKES PER CARD–	70			

FUNCTION*	SYMBOL
DUPLICATE	D
PUNCH	P
SKIP	S
X-SKIP	XS
VERIFY	V
SELF CK. NO.	CK
LEFT ZERO	LZ

E066515MSP

Date: ____________

Section ________ Page ________

Job PER–1

Plant and Equipment Record

Location				Item Number	Asset			Description	Acquisition Date	Expiration Date	Total Installed Cost	Periodic Depreciation	Factor Value	X
Plant	Bldg.	Floor	Dept.		Acct.	Class	Type							
1	1	1	5	4725	5	1	123	AUTO SCREW MACHINE	06/51	06/67	3,473.60	201.24	3,775.46	
1	1	1	5	4462	5	2	125	DRILL PRESS MODEL 2	04/50	04/66	3,600.00	313.00	3,671.00	
1	1	1	5	4462A	5	2	125	SAFETY DEVICE	04/50	04/66	96.00	6.00	98.00	
1	1	1	5	4639	5	3	015	ARBOR PRESS	10/70	10/70	595.05	29.40	619.55	
1	1	1	5	4706	5	3	39	DUPLIGRAPH PRESS	04/51	04/67	2,375.19	145.20	2,568.75	
1	1	1	5	4672	5	5	10	ROTARY SURFACE GRINDER	12/50	12/65	4,600.25	370.44	4,970.69	
1	1	1	5	4680	5	5	16	RADIAL GRINDER	01/51	01/66	1,015.26	66.24	1,087.02	
1	1	1	5	4632	5	5	39	SURFACE GRINDER	10/50	10/65	3,716.44	168.48	2,856.84	
1	1	1	5	4690	5	6	15	MILLING MACHINE	02/51	02/67	2,858.49	168.00	3,054.49	
1	1	1	5	4695	5	6	22	VER. MILLING MACH.	02/51	02/67	3,387.38	207.60	3,629.58	
1	1	1	5	4686	5	6	29	GEAR HOBBING MACH.	02/51	02/67	3,387.38	150.00	2,913.18	
1	1	1	5	4589	5	6	102	GEAR CUTTING MACHINE	08/50	08/68	3,851.59	204.00	3,987.59	
1	1	1	5	4501	6	2	18	PRECISION GAUGE	06/50	06/60	302.40	29.28	317.04	
1	1	1	5	4601	7	1	25	LATHE BENCH	08/50	08/60	482.35	48.24	514.51	
1	1	1	5	4801	7	1	28	LATHE BENCH	08/51	08/67	1,318.50	75.00	1,443.50	
1	1	1	5	4509	7	1	46	TOOL RACK	06/50	06/70	124.80	6.24	127.92	

Job PER–2

Plant and Equipment Record

Location				Item Number	Asset			Description	Acquisition Date	Expiration Date	Total Installed Cost	Periodic Depreciation	Factor Value	X
Plant	Bldg.	Floor	Dept.		Acct.	Class	Type							
7	1	7	4	5646	7	2	185	ENGINE LATHE	03/67	03/77	7,090.00	430.00	7,100.00	
7	1	7	4	7773	8	2	846	BENCH MILL	05/67	05/77	9,800.00	650.00	10,050.00	
7	1	7	4	7659	8	2	88	TAPS & DIES	05/67	05/76	650.00	125.00	700.00	
7	1	7	4	4563D	8	2	410	END-MILLS	02/68	02/78	8,000.00	590.55	8,259.90	
7	1	7	4	6530	8	2	550	MILL-CUTTER	02/67	02/77	6,550.00	400.90	7,000.00	
7	1	7	4	1174	8	2	218	REOMERS	07/67	07/77	900.00	220.00	1,100.45	
7	1	7	4	3468	8	2	90	CARBIDE	08/67	08/78	1,500.00	333.54	1,870.00	
7	1	7	4	5587	4	2	56	KELLOGG SPRAY	08/66	08/76	475.00	98.00	550.89	
7	1	7	4	5171	1	2	679	HARDING HEL. CHUCKER	08/67	08/77	8,050.50	600.00	9,100.00	
7	1	7	4	4411A	1	5	643	AIR COMPRESSOR	10/67	10/77	500.00	100.00	650.00	
7	1	7	4	7639	1	5	992	LINCOLN WELDER	10/66	10/77	2,000.00	350.98	2,500.00	
7	1	7	4	6743	1	2	594	SOCKET SET	10/67	10/77	150.00	25.00	175.00	
7	1	7	4	8653	7	2	19	GEAR HOBBING MACH.	09/68	09/78	3,387.38	388.00	4,000.00	
7	1	7	4	6753K	7	5	640	RADIAL GRINDER	11/67	11/76	1,090.45	325.68	2,329.00	
7	1	7	4	6754	8	5	81	ARBOR PRESS	11/67	11/76	635.00	186.00	760.00	
7	1	7	4	9899	8	5	403	BELT SANDER	12/67	12/77	400.00	94.56	575.00	

Job PER–3

Plant and Equipment Record

Location				Item Number	Asset			Description	Acquisition Date	Expiration Date	Total Installed Cost	Periodic Depreciation	Factor Value	X
Plant	Bldg.	Floor	Dept.		Acct.	Class	Type							
4	5	6	4	4890B	6	2	145	SCREW MACHINE	04/67	04/77	6,950.00	350.00	6,975.00	
4	5	6	4	5050	7	4	168	BELT SANDER	02/67	02/75	175.00	50.00	190.75	
4	5	6	4	6161	4	4	73	ENGINE LATHE	01/65	01/75	5,000.00	450.00	1,060.00	
4	5	6	4	7275H	3	3	241	HONING MACHINE	10/67	10/77	2,750.00	880.00	2,800.00	
4	5	6	4	8378	4	4	769	PNEUMATIC HAMMER	11/67	11/75	85.00	15.00	100.00	
4	5	6	4	9494C	4	2	888	HORIZONTAL MILL	08/67	08/77	2,500.00	75.00	2,550.00	
4	5	6	4	0570	6	4	421	VERTICAL MILL	09/67	09/75	2,000.00	65.80	2,060.00	
4	5	6	4	1617D	5	2	37	INTERNAL GRINDER	04/66	04/76	7,650.00	375.00	7,725.00	
4	5	6	4	2778	8	3	96	BAND SAW	01/67	01/77	115.00	45.00	120.50	
4	5	6	4	3839	8	1	42	DRILL PRESS	05/65	05/75	150.00	70.00	175.00	
4	5	6	4	4940	8	1	409	CENTERLESS GRINDER	05/67	05/77	7,250.00	325.00	7,375.00	
4	5	6	4	5651A	8	1	383	AIR COMPRESSOR	04/66	04/74	500.00	75.00	515.00	
4	5	6	4	6661	8	2	283	BLANCHARD GRINDER	12/67	12/77	8,100.00	900.00	8,150.00	
4	5	6	4	7273	6	2	489	AUTOMATIC LATHE	07/66	07/76	18,000.00	998.00	18,250.00	
4	5	6	4	8867E	6	4	413	PNEUMATIC SANDER	07/67	07/77	123.50	48.50	130.00	
4	5	6	4	9894	7	2	878	CARBIDE	07/67	07/77	8,400.00	890.00	8,600.00	

Job PER–4

Plant and Equipment Record

Location				Item Number	Asset			Description	Acquisition Date	Expiration Date	Total Installed Cost	Periodic Depreciation	Factor Value	X
Plant	Bldg.	Floor	Dept.		Acct.	Class	Type							
2	6	3	8	6539H	7	8	567	50 HP. SCHRAMM COMP.	08/67	08/77	35,000.00	380.00	37,000.00	
2	6	3	8	6743	7	8	874	TOOL BENCH	08/67	08/76	255.00	65.00	300.00	
2	6	3	8	8730R	7	1	762	VERSON 150T PRESS	05/67	05/76	75,000.00	200.00	7,900.00	
2	6	3	8	7640	8	1	91	WARNER & SW.	04/68	04/78	50,000.00	235.00	5,500.00	
2	6	3	8	1189	8	1	67	VERTICAL MILLING MACH.	04/67	04/75	20,000.00	375.00	23,050.00	
2	6	3	8	7419	6	1	341	LATHE BENCH	05/67	05/77	150.00	99.00	300.00	
2	6	3	8	5634L	2	1	762	MILL K & T	03/67	03/77	8,900.00	250.00	9,000.00	
2	6	3	8	6523P	4	1	893	MILL DUFOUR	03/68	03/77	9,000.00	367.78	9,900.00	
2	6	3	8	8509T	4	1	38	LOGAN LATHE	07/68	07/78	700.00	98.00	790.00	
2	6	3	8	8734M	4	6	39	AIR COMPRESSOR	08/68	08/78	450.00	75.00	500.00	
2	6	3	8	8765	4	6	759	DRILLS	09/67	09/78	9,900.00	400.68	10,000.00	
2	6	3	8	8563	4	6	390	GRINDERS 2 HP.	10/67	10/77	30,000.00	690.00	33,300.00	
2	6	3	8	7540	4	8	469	SURFACE GRINDER	10/67	10/77	35,000.00	380.00	40,500.00	
2	6	3	8	3574	4	6	611	ARBOR PRESS	11/67	11/77	7,600.00	139.99	8,200.00	
2	6	3	8	6458A	6	8	931	TABLE SAW	11/67	11/77	800.00	80.00	1,000.00	
2	6	3	8	5673	7	8	863	MILL-CUTTER	09/67	09/77	5,750.00	75.00	6,000.00	

Job PER–5

Plant and Equipment Record

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Location				Item Number	Asset			Description	Acquisition Date	Expiration Date	Total Installed Cost	Periodic Depreciation	Factor Value	X
Plant	Bldg.	Floor	Dept.		Acct.	Class	Type							
3	2	4	2	5638D	7	3	476	AIR COMP. 5 HP.	08/67	08/77	345.00	36.00	368.00	
3	2	4	2	7856	7	5	987	LATHE-SIDNEY	08/67	08/77	540.00	53.45	600.00	
3	2	4	2	8547J	7	5	677	AUTOMATIC 5 SP.	07/67	07/77	25,000.00	2,000.00	28,000.00	
3	2	4	2	9856	7	4	85	AUTOMATIC CHUCKER	07/67	07/78	7000.00	890.88	9,800.00	
3	2	4	2	5611F	5	6	74	CRI-DAN TYPE THREADER	07/67	07/78	30,000.00	5,000.00	35,750.75	
3	2	4	2	9850	5	4	764	B & S SCREW MACHINE	05/67	05/78	29,500.00	4,900.45	30,560.90	
3	2	4	2	8734	7	4	983	BRIDGEPORT MILL	04/67	04/75	20,300.90	1,990.00	25,000.90	
3	2	4	2	9567	7	4	453	GENERATOR G. E.	05/67	05/75	4,000.00	650.00	4,600.00	
3	2	4	2	1193	7	4	119	GRINDER CENTERLESS	03/67	03/74	9,800.00	800.00	10,090.00	
3	2	4	2	0987S	7	5	769	HARDINGE CHUCKER	03/67	03/76	10,900.00	900.00	20,000.00	
3	2	4	2	8763	7	6	810	TURRET LATHE	06/67	06/77	700.00	98.00	788.00	
3	2	4	2	2343	3	5	10	MILLS-SUPERMILL	06/67	06/77	5,600.50	500.60	6,500.00	
3	2	4	2	3243K	3	5	754	PUNCH PRESSES	01/67	01/76	900.00	90.00	1,000.00	
3	2	4	2	6565B	3	6	983	ROUTER	01/67	01/76	5,800.00	680.00	6,000.85	
3	2	4	2	9817C	4	6	342	STEAM GENERATOR CLAYTON	01/67	01/77	3,000.00	240.00	3,800.00	
3	2	4	2	7538	5	6	664	DRILL PRESS	02/67	02/77	1,000.00	150.00	1,550.00	

Job PER–6

Plant and Equipment Record

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Location				Item Number	Asset			Description	Acquisition Date	Expiration Date	Total Installed Cost	Periodic Depreciation	Factor Value	X
Plant	Bldg.	Floor	Dept.		Acct.	Class	Type							
7	2	4	1	6980	8	4	986	DRILL PRESS	09/66	09/76	500.90	90.00	590.00	
7	2	4	1	8464G	4	9	439	BELT SANDER	10/67	10/77	345.60	75.00	400.00	
7	2	4	1	7658	4	3	660	ARBOR PRESS	02/67	02/77	700.00	108.00	850.00	
7	2	4	1	4411A	3	8	780	HONING MACHINE	04/67	04/77	2,800.00	450.00	3,000.00	
7	2	4	1	6556E	6	2	119	ROTARY GRINDER	04/67	04/78	5,050.00	500.00	5,200.00	
7	2	4	1	5060	6	7	92	HORIZONTAL MILL	09/66	09/76	3,000.00	400.00	3,500.00	
7	2	4	1	8999	6	1	101	SURFACE GRINDER	08/67	08/77	4,068.00	345.00	4,100.90	
7	2	4	1	7625	6	6	66	INTERNAL GRINDER	10/67	10/77	8,550.90	600.90	8,650.00	
7	2	4	1	8412	6	5	45	VER. MILLING MACH.	10/67	10/77	6,565.00	400.55	7,000.00	
7	2	4	1	6673F	5	4	232	DRILL PRESS MODEL 2	11/67	11/77	900.00	200.00	1,000.00	
7	2	4	1	7704	8	4	11	GEAR CUTTING MACHINE	11/66	11/76	3,300.00	350.00	3,600.00	
7	2	4	1	8796B	2	9	694	AIR COMPRESSOR	10/67	10/77	4,060.60	400.00	4,400.00	
7	2	4	1	6660C	1	9	92	LATHE BENCH	07/67	07/78	9,000.00	655.00	10,000.00	
7	2	4	1	9876I	1	9	29	AUTOMATIC LATHE	07/68	07/78	5,695.00	280.00	6,350.00	
7	2	4	1	3782K	2	3	100	TOOL RACK	07/67	07/77	775.00	195.78	900.00	
7	2	4	1	7749	8	9	89	BENCH MILL	08/68	08/77	10,000.00	560.00	10,590.00	

SUPPLEMENTAL PRACTICE EXERCISE 3

General Instructions: 24, 26, and 29 Keypunches

1. Design and punch a program card to punch the Sales Invoices Register.
2. Utilize the program card designed from step 1 and keypunch the exercises.
3. Correct all error cards.

Selectric Typewriter Instructions

1. Set the margin stops at 1 and 80.
2. Set tab stops where necessary to tab over alphabetic fields.
3. Type the exercise.
4. Retype any line containing errors.

Sales Invoice Register

CC 1–20	21–25	26–30	31–33	34–36	37–38	39–40	41–45	46–49	50–52	53–55	56–60	61–66	80
Customer Name or Product	Invoice Date	Number	Br.	Sm.	City	St.	Customer Number	Quantity	Product Gr.	Item	Unit Price	Gross Price	X
TABLE	07187	42404	015	021	10	05	00663	0040	048	024	204.00	8160.00	
LAMP	07187	42404	015	021	10	05	00663	0036	040	408	030.00	1080.00	
MIXER	07187	42404	015	021	10	05	00663	0022	040	424	023.69	0521.18	
IRON	07187	42404	015	021	10	05	00663	0019	040	480	016.98	0322.62	
CHAIR	07187	42404	015	021	10	05	00663	0012	048	697	154.00	1848.00	
CAN OPENER	07187	42404	015	021	10	05	00663	0043	040	712	018.00	0774.00	
COFFEE POT	07187	42404	015	021	10	05	00663	0029	040	720	020.79	0602.91	
HAIR DRYER	07187	42404	015	021	10	05	00663	0018	040	776	029.98	0539.64	
ELECTRIC BLANKET	07187	42404	015	021	10	05	00663	0009	040	864	034.50	0310.50	
FOOT STOOL	07187	42404	015	021	10	05	00663	0004	049	964	043.00	0172.00	

Sales Invoice Register

CC 1–20	21–25	26–30	31–33	34–36	37–38	39–40	41–45	46–49	50–52	53–55	56–60	61–66	80
Customer Name or Product	Invoice Date	Number	Br.	Sm.	City	St.	Customer Number	Quantity	Product Gr.	Item	Unit Price	Gross Price	X
PENNEYS	07117	43120	241	042	31	40	31960	0016	160	359	008.10	0129.60	
SEARS	07117	43212	360	049	36	40	43120	0020	116	383	005.20	0104.00	
MAY CO.	07117	43121	490	048	31	40	59654	0015	153	424	007.10	0106.50	
BUFFUMS	07117	43123	230	045	34	40	29031	0018	110	537	006.40	0115.20	
BULLOCKS	07117	43124	450	039	36	40	49320	0021	140	583	005.10	0107.10	
ANTHONYS	07117	43125	420	040	34	40	82008	0029	112	912	008.20	0237.80	
QUIGLEYS	07117	43126	410	050	31	40	56908	0014	116	855	005.20	0072.80	
BROADWAY	07117	43127	319	020	36	40	43201	0016	110	704	006.40	0102.40	
SPRINGS	07117	43128	460	060	34	40	67891	0017	114	755	009.77	0166.09	
SINGERS	07117	43129	051	051	36	40	54371	0012	110	619	006.40	0076.80	

Sales Invoice Register

CC 1–20	21–25	26–30	31–33	34–36	37–38	39–40	41–45	46–49	50–52	53–55	56–60	61–66	80
Customer Name or Product	Invoice Date	Invoice Number	Br.	Sm.	City	St.	Customer Number	Quantity	Product Gr.	Product Item	Unit Price	Gross Price	X
ADAMS, JANE	07187	68742	191	414	59	50	75012	0040	014	003	079.02	3,160.80	
BROWN, BILL	07187	68742	191	414	59	50	49701	0152	074	099	105.00	5,460.00	
CARTER, SUE	07187	68742	191	414	59	50	67797	0114	018	100	063.25	7,210.50	
DOWDY, RAY	07187	68742	191	414	59	50	44579	0232	020	021	042.85	9,941.20	
EDWARDS, KAY	07187	68742	191	414	59	50	29170	0200	020	022	044.00	8,800.00	
FOX, JAY	07187	68742	191	414	59	50	84892	0080	018	101	065.00	5,200.00	
KELLY, JEANE	07187	68742	191	414	59	50	14698	0063	074	100	107.50	6,772.50	
STONE, BOB	07187	68742	191	414	59	50	29935	0054	014	079	085.00	4,590.00	
WILSON, JUNE	07187	68742	191	414	59	50	90502	0125	017	123	034.23	4,278.75	
WILLIAMS, BOB	07187	68742	191	414	59	50	00743	0100	018	105	069.18	6,918.00	

Sales Invoice Register

CC 1–20	21–25	26–30	31–33	34–36	37–38	39–40	41–45	46–49	50–52	53–55	56–60	61–66	80
Customer Name or Product	Invoice Date	Invoice Number	Br.	Sm.	City	St.	Customer Number	Quantity	Product Gr.	Product Item	Unit Price	Gross Price	X
ADAMS, PAUL	04177	53264	064	129	19	46	28468	0119	921	204	009.75	1160.25	
BATES, SALLY	03147	90126	064	129	19	46	12940	0104	172	104	008.26	0859.04	
CALL, MARY	07167	84679	064	129	19	46	22266	0107	293	907	001.24	0132.68	
DAVIDSON, JIM	01147	77824	064	129	19	46	11348	0908	344	806	000.92	0835.36	
FISHER, RAY	02167	11230	064	129	19	46	90467	0078	725	203	001.62	0126.36	
GATES, PAT	01097	12345	064	129	19	46	86860	0045	996	104	006.41	0288.45	
HILLMAN, BILL	08127	67120	064	129	19	46	77820	0102	417	208	001.21	0123.42	
JACKSON, SAM	01117	46821	064	129	19	46	36491	0109	118	312	004.44	0483.96	
MARTIN, DAVID	11127	58041	064	129	19	46	46780	0046	090	416	006.11	0281.06	
OLSON, SANDY	12147	66812	064	129	19	46	94505	0050	019	524	005.22	0261.00	

Sales Invoice Register

CC 1–20	21–25	26–30	31–33	34–36	37–38	39–40	41–45	46–49	50–52	53–55	56–60	61–66	80
Customer Name or Product	Invoice Date	Invoice Number	Br.	Sm.	City	St.	Customer Number	Quantity	Product Gr.	Product Item	Unit Price	Gross Price	X
ANDERSON, BILL	04147	24695	242	165	78	61	24046	0070	024	152	001.10	0077.00	
BARNES, JACK	04147	24598	242	165	78	61	24057	0360	026	965	002.45	0882.00	
DEMPSEY, BOB	04147	67543	242	165	78	61	24079	0028	017	708	003.60	0100.80	
FLOOD, JANE	04147	87645	242	165	78	61	24097	0032	020	875	001.80	0057.60	
HORN, DONNA	04147	76538	242	165	78	61	24086	0111	032	204	002.25	0249.75	
JACKSON, MAE	04147	87490	242	165	78	61	24075	0029	059	198	003.40	0098.60	
LAVERNE, TOM	04147	75210	242	165	78	61	24068	0241	061	600	004.00	0964.00	
MAZE, TERRI	04147	64309	242	165	78	61	24064	0068	010	202	002.60	0176.80	
PETERSON, DON	04147	76771	242	165	78	61	24088	0097	048	333	001.90	0184.30	
WALTERS, DEE	04147	23206	242	165	78	61	24092	0101	074	560	005.50	0555.50	

Sales Invoice Register

CC 1–20	21–25	26–30	31–33	34–36	37–38	39–40	41–45	46–49	50–52	53–55	56–60	61–66	80
Customer Name or Product	Invoice Date	Invoice Number	Br.	Sm.	City	St.	Customer Number	Quantity	Product Gr.	Product Item	Unit Price	Gross Price	X
ALLEN, JOHN	07197	43697	021	861	40	98	50632	0010	009	414	002.99	0029.90	
BUCK, DEAN	07197	43698	076	292	40	98	40100	0012	009	370	008.39	0100.68	
DALES, BETTY	07197	43699	044	413	40	98	90678	0006	028	625	012.95	0077.70	
EAST, TOM	07197	43700	043	634	40	98	43261	0003	028	742	033.95	0101.85	
FROST, DAVE	07197	43701	012	885	40	98	89761	0012	003	601	009.95	0119.40	
GOUGH, STEVE	07197	43702	016	626	40	98	22367	0024	071	590	006.29	0150.96	
HEAL, ED	07197	43703	055	247	40	89	00302	0024	042	232	003.35	0080.40	
JOHNS, CHRIS	07197	43704	064	368	40	89	76110	0006	042	684	027.50	0165.00	
SMITH, TERRI	07197	43705	089	489	40	89	10892	0003	042	786	189.00	0567.00	
THOMAS, LYNN	07197	43706	010	640	40	89	64555	0012	095	895	008.49	0101.88	

COMPUTER PROGRAM KEYPUNCHING: EXERCISES 1–4

The following exercises introduce the student to the punching of computer programs. The exercises should not be used as drills on the Selectric typewriter. It should be noted that these drills require the use of the special symbol keys; therefore, keypunching speeds will be noticeably reduced. There is one short SPS exercise, one COBOL program, and one RPG program (the last two consist of several pages of instructions). FORTRAN punching exercises follow these exercises and can be used at this time, providing that the keypunch is equipped with the proper mathematic symbols.

Special Note: The single quote punch that is required in an RPG program consists of a 5 and an 8 punch in the same card column. The 26 keypunch single quote consists of a 4 and an 8 punch. To punch the proper special characters, the multiple punch key should be used instead of the single quote key.

General Instructions: 24, 26, and 29 Keypunches

1. Raise the starwheels to place the keypunch into alphabet shift—*or* carefully analyze the program and design a program card to aid in the punching of the exercise. If alternate programming capabilities are available, they should be utilized in order to increase your actual keypunching speed.
2. Keypunch the entire computer program, placing each line of the program on a different card. Be careful to keypunch the data in the right columns. Visually check each card for accuracy before continuing. Correct each card in error by rekeypunching.
3. Rekeypunch the exercise again without stopping. However, time yourself to see how long it takes to complete the exercise. Do not be too concerned if your punching speed is not as good as in the past. You are learning new keys, and alphabetic data always take more time than numeric data.
4. Each program may be punched several times to gain additional practice.

Estimating Your Keypunching Speed

Approximate Number of Keystrokes Per Exercise	Keystrokes Per Hour	Time in Minutes
	SPS Program	
840	1,000	50
	2,000	25
	3,000	17
	4,000	12½
	5,000	10
	6,000	8½
	8,000	6
	10,000	5
	COBOL Program	
5,260	1,000	300 (5 hours)
	2,000	150 (2½ hours)
	3,000	105 (1 hour, 45 minutes)
	4,000	75 (1 hour, 15 minutes)
	5,000	64
	6,000	53
	8,000	38
	10,000	32
	RPG Program	
5,000	1,000	294 (4 hours, 56 minutes)
	2,000	147 (2 hours, 27 minutes)
	3,000	100 (1 hour, 40 minutes)
	4,000	74 (1 hour, 14 minutes)
	5,000	60
	6,000	50
	8,000	37
	10,000	30

IBM

1620/1710 Symbolic Programming System
Coding Sheet

Program: SPS Problem 1 Date: Page No. 01 of

Routine: Programmer:

Line 3 5	Label 6 11	Operation 12 15	Operands & Remarks 16 20 25 30 35 40 45 50 55 60 65 70 75
010	INPUT	DSS	80
020	MS61	DAC	9, EMPLOYEE@
030	MS62	DAC	5, DEPT@
040	MS63	DAC	11, UNION CODE
050	MS64	DAC	5, RATE@
060	EMP	DS	, INPUT+2
070	DEPT	DS	, INPUT+5
080	UC	DS	, INPUT+12
090	RATE	DS	, INPUT+21
100	SW1	DC	2, 0
110	DIV	DS	, INPUT+79
120	START	RCTY	
130		WATY	MS61
140		TBTY	
150		WATY	MSG2
160		TBTY	
170		WATY	MSG3
180		TBTY	
190		WATY	
200		RCTY	
	BEGIN	RCTY	
		RNCD	INPUT
		SF	DIV-1
		CM	DIV, 1, 10
		BNE	GO
		SF	SW1

IBM

1620/1710 Symbolic Programming System
Coding Sheet

Program: ____

Date: ____

Page No. 0 2 of ____

Routine: ____

Programmer: ____

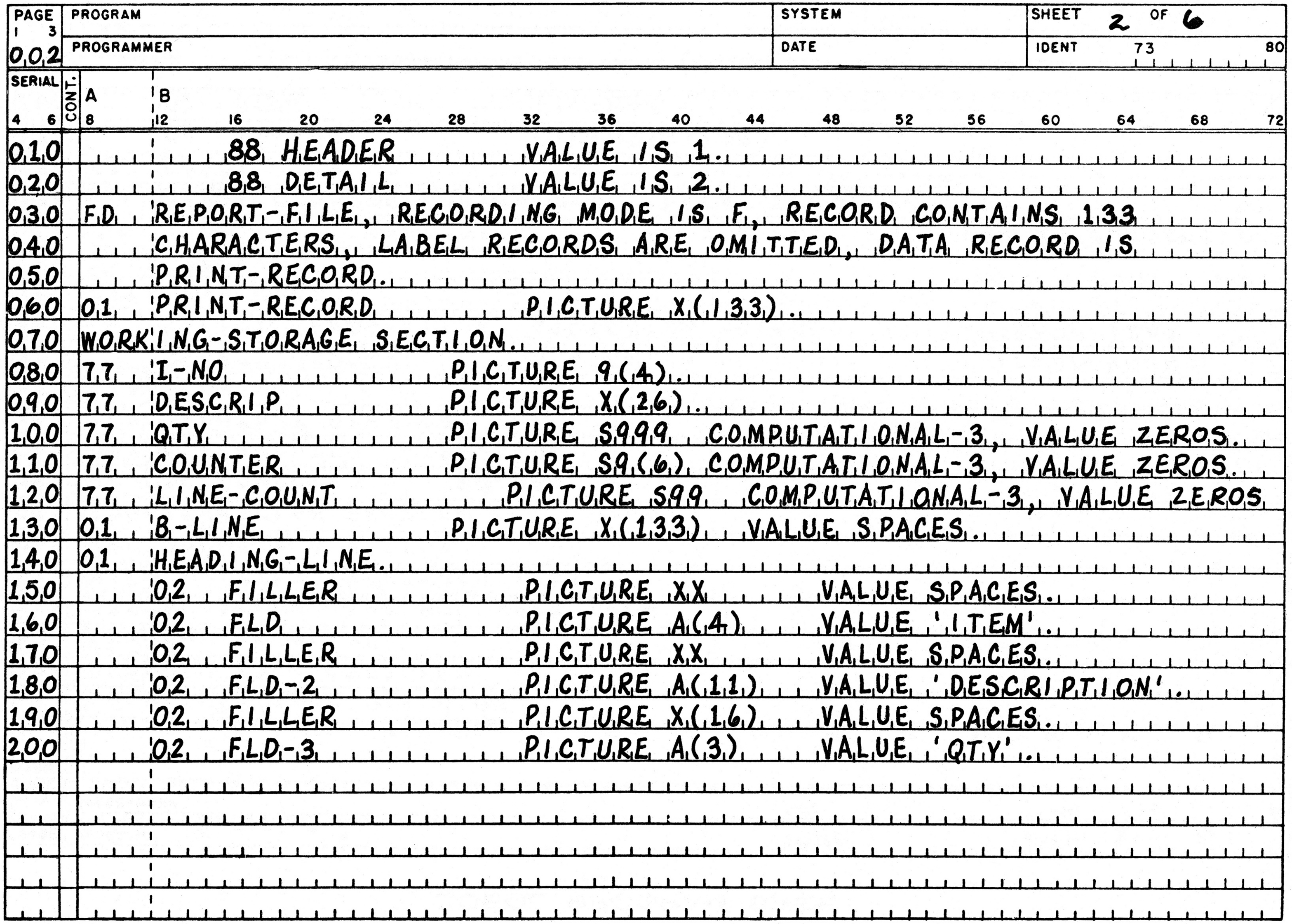
Line (3–5)	Label (6–11)	Operation (12–15)	Operands & Remarks (16–75)
010		TD	EMP+1,400
020		TD	DEPT+1400
030		TD	UC+1,400
040		TD	RATE+1,400
050		WNTY	EMP-2
060		TBTY	
070		WNTY	DEPT-1
080		TBTY	
090		WNTY	UC-3
100		TBTY	
110		BNF	TYPE,SW1
120		CF	SW1
130		B	CIEAR
140		WNTY	RATE-2
150		B	BEGIN
160		DEND	START
170			
180			
190			
200			

COBOL PROGRAM SHEET

PAGE 001
PROGRAM Exercise 2
PROGRAMMER
SYSTEM
DATE
SHEET 1 OF 6
IDENT

```
010 IDENTIFICATION DIVISION.
020 PROGRAM-ID.  'STERLING'.
030 AUTHOR.  STERLING.
040 INSTALLATION.  ABC BUSINESS TECH.
050 DATE-WRITTEN.  NOVEMBER 1967
060 ENVIRONMENT DIVISION.
070 CONFIGURATION SECTION.
080 SOURCE-COMPUTER.   IBM-360.
090 OBJECT-COMPUTER.   IBM-360.
100 INPUT-OUTPUT SECTION.
110 FILE-CONTROL
120     SELECT CARD-FILE    ASSIGN TO 'SYS001' UNIT-RECORD 2540R.
130     SELECT REPORT-FILE  ASSIGN TO 'SYS002' UNIT-RECORD 1403.
140 DATA DIVISION.
150 FILE SECTION
160 FD  CARD-FILE, RECORDING MODE IS F RECORD CONTAINS 80 CHARACTERS
170     LABEL RECORDS ARE OMITTED DATA RECORD IS CARD
180 01  CARD
190     02  FILLER          PICTURE X(79).
200     02  CODE            PICTURE 9.
```

COBOL PROGRAM SHEET



PAGE 002

PROGRAM

PROGRAMMER

SYSTEM

DATE

SHEET 2 OF 6

IDENT

```
010         88 HEADER       VALUE IS 1.
020         88 DETAIL       VALUE IS 2.
030 FD  REPORT-FILE, RECORDING MODE IS F, RECORD CONTAINS 133
040     CHARACTERS, LABEL RECORDS ARE OMITTED, DATA RECORD IS
050     PRINT-RECORD.
060 01  PRINT-RECORD        PICTURE X(133).
070 WORKING-STORAGE SECTION.
080 77  I-NO            PICTURE 9(4).
090 77  DESCRIP         PICTURE X(26).
100 77  QTY             PICTURE S999  COMPUTATIONAL-3, VALUE ZEROS.
110 77  COUNTER         PICTURE S9(6) COMPUTATIONAL-3, VALUE ZEROS.
120 77  LINE-COUNT         PICTURE S99  COMPUTATIONAL-3, VALUE ZEROS
130 01  B-LINE          PICTURE X(133)  VALUE SPACES.
140 01  HEADING-LINE.
150     02  FILLER          PICTURE XX      VALUE SPACES.
160     02  FLD             PICTURE A(4)    VALUE 'ITEM'.
170     02  FILLER          PICTURE XX      VALUE SPACES.
180     02  FLD-2           PICTURE A(11)   VALUE 'DESCRIPTION'.
190     02  FILLER          PICTURE X(16)   VALUE SPACES.
200     02  FLD-3           PICTURE A(3)    VALUE 'QTY'.
```

COBOL PROGRAM SHEET

PAGE 003

PROGRAM

PROGRAMMER

SYSTEM

DATE

SHEET 3 OF 6

IDENT

```
010     02  FILLER          PICTURE X(95)   VALUE SPACES.
020 01  DETAIL-LINE.
030     02  FILLER          PICTURE XX      VALUE SPACES.
040     02  ITEM            PICTURE 9(4).
050     02  FILLER          PICTURE XX      VALUE SPACES.
060     02  DES             PICTURE X(26)
070     02  FILLER          PICTURE X       VALUE SPACES.
080     02  QUANT           PICTURE 222.
090     02  FILLER          PICTURE XX      VALUE SPACES.
100     02  FLD-1           PICTURE A(11)   VALUE SPACES.
110     02  FILLER          PICTURE X(82)   VALUE SPACES.
120 01  TOTAL-LINE
130     02  FILLER      PICTURE XX      VALUE SPACES.
140     02  TOTAL       PICTURE A(11)   VALUE 'FINAL TOTAL'
150     02 , FILLER     PICTURE XX
160     02  SUM         PICTURE 222,222.
170     02  FILLER      PICTURE X(111)  VALUE SPACES.
180 01  HEADER-H
190     02 ITEM-H           PICTURE 9(4).
200     02 DESCRIPTION      PICTURE X(26).
```

COBOL PROGRAM SHEET

PAGE 004 | PROGRAM | SYSTEM | SHEET 4 OF 6
PROGRAMMER | DATE | IDENT

```
SERIAL A   B
010        02  FILLER                PICTURE X(50)    VALUE SPACES.
020    01  DETAIL-H.
030        02  ITEM-NO               PICTURE 9(4).
040        02  QUANTITY        PICTURE 9(3).
050        02  FILLER                PICTURE X(73).
060    PROCEDURE DIVISION.
070    START.
080        OPEN INPUT CARD-FILE, OUTPUT REPORT-FILE
090        WRITE PRINT-RECORD FROM HEADING-LINE AFTER ADVANCING 0 LINES.
100        WRITE PRINT-RECORD FROM B-LINE AFTER ADVANCING 2 LINES
110        READ CARD-FILE, AT END 60 TO WRAP-UP.
120    BEGIN-LINE.
130        IF HEADER MOVE CARD TO HEADER-H, MOVE ITEM-H TO I NO, MOVE
140        DESCRIPTION TO DESCRIP, GO TO LOOP-1.
150        IF DETAIL MOVE CARD TO DETAIL-H, GO TO LOOP-2.
160        READ CARD-FILE AT END PERFORM FINISH-LINE, GO TO WRAP-UP.
170        GO TO BEGIN-LINE.
180    LOOP-1.
190        READ CARD-FILE AT END PERFORM NO-DETAIL, GO TO WRAP-UP.
200        IF DETAIL MOVE CARD TO DETAIL-H, GO TO LOOP-2.
```

COBOL PROGRAM SHEET

PAGE 005	PROGRAM	SYSTEM	SHEET 5 OF 6
	PROGRAMMER	DATE	IDENT

```
010     IF HEADER MOVE CARD TO HEADER-H, PERFORM NO-DETAIL, GO TO
020     LOOP-1, ELSE GO TO LOOP-1.
030 LOOP-2.
040     IF ITEM-NO IS EQUAL TO I-NO, ADD QUANTITY TO COUNTER, ADD
050     QUANTITY TO QTY, GO TO CONTINUE.
060     STOP 'MISSING HEADER'.
070     READ CARD-FILE AT END PERFORM FINISH-LINE, GO TO WRAP-UP.
080     GO TO BEGIN-LINE.
090 CONTINUE.
100     READ CARD-FILE AT END PERFORM FINISH-LINE GO TO WRAP-UP.
110     IF HEADER MOVE CARD TO HEADER-H, PERFORM FINISH-LINE, GO TO
120     BEGIN-LINE.
130     IF DETAIL MOVE CARD TO DETAIL-H, GO TO LOOP-2, ELSE GO TO
140     CONTINUE.
150 NO-DETAIL.
160     MOVE I-NO TO ITEM.
170     MOVE DESCRIP TO DES.
180     MOVE 'NO ACTIVITY' TO FLD-1.
190     WRITE PRINT-RECORD FROM DETAIL-LINE AFTER ADVANCING 1 LINES
200     MOVE SPACES TO DETAIL-LINE.
```

COBOL PROGRAM SHEET

PAGE 1 3 006

PROGRAM

PROGRAMMER

SYSTEM

DATE

SHEET 6 OF 6

IDENT 73 80

```
SERIAL  CONT. A   B
4   6         8   12  16  20  24  28  32  36  40  44  48  52  56  60  64  68  72
010               MOVE ITEM-H TO I-NO.
020               MOVE DESCRIPTION TO DESCRIP.
030           FINISH-LINE
040               ADD 1 TO LINE-COUNT.
050               IF LINE-COUNT IS GREATER THAN 39 WRITE PRINT-RECORD FROM
060               HEADING-LINE AFTER ADVANCING 0 LINES, WRITE PRINT-RECORD
070               FROM B-LINE AFTER ADVANCING 2 LINES, MOVE ZEROS TO
080               LINE-COUNT.
090               MOVE I-NO TO ITEM.
100               MOVE DESCRIP TO DES.
110               MOVE QTY TO QUANT.
120               MOVE ZEROS TO QTY.
130               WRITE PRINT-RECORD FROM DETAIL-LINE AFTER ADVANCING 1 LINES
140               MOVE SPACES TO DETAIL-LINE.
150           WRAP-UP.
160               MOVE COUNTER TO SUM.
170               WRITE PRINT-RECORD FROM TOTAL-LINE AFTER ADVANCING 3 LINES
180               CLOSE CARD-FILE REPORT FILE.
190               STOP RUN.
200
```

REPORT PROGRAM GENERATOR FILE DESCRIPTION SPECIFICATIONS

IBM System/360

Date

Program *Exercise 3*

Programmer

Punching Instruction	Graphic							
	Punch							

Page (1 2) 01

Program Identification (75 76 77 78 79 80)

Line (3 4 5)	Form Type (6)	Filename (7–14)	File Type: I/O/U/C (15)	File Designation: P/S/C/R/T (16)	End of File: E (17)	Sequence: A/D (18)	File Format: F/V (19)	Block Length (20–23)	Record Length (24–27)	Mode of Processing: L/R (28)	Length of Record Address Field (29–30)	Record Address Type: K/I (31)	Type of File Organization: I/D/T (32)	Overflow Indicator (33–34)	Key Field Starting Location (35–38)	Extension Code E/L (39)	Device (40–46)	Symbolic Device (47–52)	Labels (S, N, or E) (53)	Name of Label Exit (54–59)	Extent Exit for DAM (60–65)	Comments (66–74)
01	F	EMMA	I	P	E	A	F	3598	514			K	I		2		DISK11	SYS007	S			MASTER
02	F	DETAIL	I	S	E	A	F	80	80								READ40	SYSRDR				DETAIL
03	F	PRINTOUT	O				V	132	132					OF			PRINTERS					REPORT
04	F																					
05	F																					
06	F																					
07	F																					
08	F																					
09	F																					
10	F																					
11	F																					
12	F																					
13	F																					
14	F																					
15	F																					
	F																					
	F																					
	F																					
	F																					
	F																					

Card Electro Number

REPORT PROGRAM GENERATOR INPUT SPECIFICATIONS

IBM System/360

Date ____________

Program ____________

Programmer ____________

Punching Instruction	Graphic							
	Punch							

Page (1 2) 02

Program Identification (75 76 77 78 79 80)

Line (3 4 5)	Form Type (6)	Filename (7–14)	Sequence (15 16)	Number (1-N) (17)	Option (O) (18)	Resulting Indicator (19 20)	Record Identification Codes 1: Position (21–24)	Not (N) (25)	C/Z/D (26)	Character (27)	Record Identification Codes 2: Position (28–31)	Not (N) (32)	C/Z/D (33)	Character (34)	Record Identification Codes 3: Position (35–38)	Not (N) (39)	C/Z/D (40)	Character (41)	Stacker Select (42)	Packed (P) (43)	Field Location From (44–47)	Field Location To (48–51)	Decimal Positions (52)	Field Name (53–58)	Control Level (L1-L9) (59 60)	Matching Fields or Chaining Fields (61 62)	Field-Record Relation (63 64)	Field Indicators Plus (65 66)	Field Indicators Minus (67 68)	Field Indicators Zero or Blank (69 70)	Sterling Sign Position (71–74)
01	I	EMMA	AA			01	1		C		2	N	C	1	142		C	H													
02	I	O	R			03	1		C		2	N	C	1	142		C	E													
03	I	O	R				1		C		2	N	C	1	142		C	B													
04	I	O	R				1		C		2	N	C	1	142		C	N													
05	I																				003	007	0	EMM002							
06	I																				147	147	0	EMM147							
07	I																				142	142		EMM142							
08	I																			P	340	342	1	EMM340						21	
09	I																			P	343	345	1	EMM343						22	
10	I																			P	346	348	1	EMM346						23	
11	I																			P	415	416	1	EMM415						24	
12	I																			P	417	418	1	EMM417						25	
13	I																			P	419	420	1	EMM419						26	
14	I																			P	421	422	1	EMM421						27	
15	I	DETAIL	01	1		05	1		C	H																					
	I																														
	I																														
	I																														
	I																														
	I																														

Card Electro Number ____________

REPORT PROGRAM GENERATOR INPUT SPECIFICATIONS

IBM System/360

Date

Program

Programmer

Punching Instruction	Graphic							
	Punch							

Page (1 2) 03

Program Identification (75 76 77 78 79 80)

Line 3 4 5	Form Type 6	Filename 7–14	Sequence 15 16	Number (1-N) 17	Option (O) 18	Resulting Indicator 19 20	Record Identification Codes 1: Position 21–24	1: Not (N) 25	1: C/Z/D 26	1: Character 27	2: Position 28–31	2: Not (N) 32	2: C/Z/D 33	2: Character 34	3: Position 35–38	3: Not (N) 39	3: C/Z/D 40	3: Character 41	Stacker Select 42	Packed (P) 43	Field Location From 44–47	Field Location To 48–51	Decimal Positions 52	Field Name 53–58	Control Level (L1-L9) 59 60	Matching Fields or Chaining Fields 61 62	Field-Record Relation 63 64	Field Indicators Plus 65 66	Field Indicators Minus 67 68	Field Indicators Zero or Blank 69 70	Sterling Sign Position 71–74
01	I	O	R			06	1		C	S																					
02	I																				01	01		SET							
03	I		02	N	O	02	6		C	H																					
04	I																				01	05	0	CD01	L1	M1					
05	I																				09	12	1	CD09							
06	I																				13	16	1	CD13							
07	I																				17	20	1	CD17							
08	I																				21	24	1	CD21							
09	I																				25	28	1	CD25							
10	I																				29	32	1	CD29							
11	I																				33	36	1	CD33							
12	I																				37	40	1	CD37							
13	I																				76	79	1	CD76							
14	I																														
15	I																														
	I																														
	I																														
	I																														
	I																														
	I																														

Card Electro Number

REPORT PROGRAM GENERATOR CALCULATION SPECIFICATIONS

IBM System/360

Date ______

Program ______

Programmer ______

Punching Instruction: Graphic ______ Punch ______

Page (1 2) 04

Program Identification (75 76 77 78 79 80) ______

Line (3-5)	Form Type (6)	Control Level (L0-L9, LR) (7-8)	Indicators: Not (9-11)	Indicators: And, Not (12-14)	Indicators: And, Not (15-17)	Factor 1 (18-27)	Operation (28-32)	Factor 2 (33-42)	Result Field (43-48)	Field Length (49-51)	Decimal Positions (52)	Half Adjust (H) (53)	Resulting Indicators: Plus / Compare High 1 > 2 (54-55)	Resulting Indicators: Minus / Compare Low 1 < 2 (56-57)	Resulting Indicators: Zero or Blank / Compare Equal 1 = 2 (58-59)	Comments (60-74)
01	C						SETOF						H0			
02	C	*														
03	C	*	TEST	FOR		HRLY OR SAL	RUN									
04	C					HRLYSA	TAG									
05	C		07				GOTO	HRLY								
06	C		08				GOTO	SAL								
07	C		05				SETON									
08	C		06				SETON						07			
09	C						GOTO	HRLYSA					08			
10	C	*														
11	C	*	SAL	CALC		SPEC										
12	C					SAL	TAG									
13	C		MR	02		H09	ADD	CD09	H09	6	1					
14	C		MR	02		H13	ADD	CD13	H13	6	1					
15	C		MR	02		H17	ADD	CD17	H17	6	1					
	C															
	C															
	C															
	C															
	C															

Card Electro Number ______

REPORT PROGRAM GENERATOR CALCULATION SPECIFICATIONS

IBM System/360

Date ____

Program ____

Programmer ____

Punching Instruction	Graphic						
	Punch						

Page (1 2) 05

Program Identification (75 76 77 78 79 80) ____

Line (3 4 5)	Form Type (6)	Control Level (L0-L9, LR) (7 8)	Indicators Not (9)	Indicators (10 11)	And Not (12)	And (13 14)	And Not (15)	And (16 17)	Factor 1 (18–27)	Operation (28–32)	Factor 2 (33–42)	Result Field (43–48)	Field Length (49 50 51)	Decimal Positions (52)	Half Adjust (H) (53)	Resulting Indicators Plus / Compare High 1 > 2 (54 55)	Minus / Low 1 < 2 (56 57)	Zero or Blank / Equal 1 = 2 (58 59)	Comments (60–74)
01	C			MR		02			H21	ADD	C021	H21	6	1					
02	C			MR		02			H25	ADD	CD25	H25	6	1					
03	C			MR		02			H29	ADD	CD29	H29	6	1					
04	C			MR		02			H33	ADD	CD33	H33	6	1					
05	C			MR		02			H37	ADD	CD37	H37	6	1					
06	C			03	N	MR			EMM147	COMP	7						11		
07	C			03	N	MR		11	TH33	ADD	EMM340	TH33	6	1					
08	C			03	N	MR		11	TH29	ADD	EMM421	TH29	6	1					
09	C			03	N	MR		11	TH25	ADD	EMM419	TH25	6	1					
10	C			03	N	MR		11	TH21	ADD	EMM417	TH21	6	1					
11	C			03	N	MR		11	TH17	ADD	EMM415	TH17	6	1					
12	C			03	N	MR		11	TH13	ADD	EMM346	TH13	6	1					
13	C			03	N	MR		11	TH09	ADD	EMM343	TH09	6	1					
14	C			02					TH33	ADD	CD33	TH33	6	1					
15	C			02					TH29	ADD	CD29	TH29	6	1					
	C																		
	C																		
	C																		
	C																		
	C																		

Card Electro Number ____

REPORT PROGRAM GENERATOR CALCULATION SPECIFICATIONS

IBM System/360

Date

Program

Programmer

Punching Instruction		
	Graphic	
	Punch	

Page 06 (1 2)

Program Identification (75 76 77 78 79 80)

Line (3 4 5)	Form Type (6)	Control Level (L0-L9, LR) (7 8)	Indicators Not (9 10 11)	Indicators And Not (12 13 14)	Indicators And Not (15 16 17)	Factor 1 (18–27)	Operation (28–32)	Factor 2 (33–42)	Result Field (43–48)	Field Length (49 50 51)	Decimal Positions (52)	Half Adjust (H) (53)	Resulting Indicators Plus / Compare High 1 > 2 (54 55)	Minus / Low 1 < 2 (56 57)	Zero or Blank / Equal 1 = 2 (58 59)	Comments (60–74)
01	C		02			TH25	ADD	CD25	TH25							
02	C		02			TH21	ADD	CD21	TH21							
03	C		02			TH17	ADD	CD17	TH17							
04	C		02			TH13	ADD	CD13	TH13							
05	C		02			TH09	ADD	CD09	TH09							
06	C		02			TH37	ADD	CD37	TH37	6	1					
07	C						GOTO	OUT								
08	C	*														
09	C	*	HRLY CALC SPEC													
10	C					HRLY	TAG									
11	C		MR	01			Z-ADD	EMM343	H09	6	1					
12	C		MR	01			Z-ADD	EMM346	H13	6	1					
13	C		MR	01			Z-ADD	EMM415	H17	6	1					
14	C		MR	01			Z-ADD	EMM417	H21	6	1					
15	C		MR	01			Z-ADD	EMM419	H25	6	1					
	C															
	C															
	C															
	C															
	C															

Card Electro Number

REPORT PROGRAM GENERATOR CALCULATION SPECIFICATIONS

IBM System/360

Date ____________

Program ____________

Programmer ____________

Punching Instruction	Graphic							
	Punch							

Page (1 2) 07

Program Identification (75 76 77 78 79 80) ☐☐☐☐☐☐

Line (3-5)	Form Type (6)	Control Level (L0-L9, LR) (7-8)	Indicators: Not (9-11)	Indicators: And Not (12-14)	Indicators: And Not (15-17)	Factor 1 (18-27)	Operation (28-32)	Factor 2 (33-42)	Result Field (43-48)	Field Length (49-51)	Decimal Positions (52)	Half Adjust (H) (53)	Resulting Indicators: Plus / Compare High 1>2 (54-55)	Minus / Low 1<2 (56-57)	Zero or Blank / Equal 1=2 (58-59)	Comments (60-74)
01	C		MR	01			Z-ADD	EMM421	H29	6	1					
02	C		MR	01			Z-ADD	EMM340	H33	6	1					
03	C		MR	02		H09	ADD	CD09	H09	6	1					
04	C		MR	02		H13	ADD	CD13	H13	6	1					
05	C		MR	02		H17	ADD	CD17	H17	6	1					
06	C		MR	02		H21	ADD	CD21	H21	6	1					
07	C		MR	02		H25	ADD	CD25	H25	6	1					
08	C		MR	02		H29	ADD	CD29	H29	6	1					
09	C		MR	02		H33	ADD	CD33	H33	6	1					
10	C		MR	02		H37	ADD	CD37	H37	6	1					
11	C		01			TH33	ADD	EMM340	TH33	6	1					
12	C		01			TH29	ADD	EMM421	TH29	6	1					
13	C		01			TH25	ADD	EMM419	TH25	6	1					
14	C		01			TH21	ADD	EMM417	TH21	6	1					
15	C		01			TH17	ADD	EMM415	TH17	6	1					
	C															
	C															
	C															
	C															
	C															

Card Electro Number ____________

REPORT PROGRAM GENERATOR CALCULATION SPECIFICATIONS

IBM System/360

Date ______

Program ______

Programmer ______

Punching Instruction	Graphic							
	Punch							

Page (1 2) 08

Program Identification (75 76 77 78 79 80)

Line (3 4 5)	Form Type (6)	Control Level (L0-L9, LR) (7 8)	Indicators: Not (9), And Not (12), And Not (15) (10–17)	Factor 1 (18–27)	Operation (28–32)	Factor 2 (33–42)	Result Field (43–48)	Field Length (49–51)	Decimal Positions (52)	Half Adjust (H) (53)	Resulting Indicators: Plus / Compare: High 1 > 2 (54 55)	Minus / Low 1 < 2 (56 57)	Zero or Blank / Equal 1 = 2 (58 59)	Comments (60–74)
01	C		01	TH13	ADD	EMM346	TH13	6	1					
02	C		01	TH09	ADD	EMM343	TH09	6	1					
03	C		02	TH33	ADD	CD33	TH33							
04	C		02	TH29	ADD	CD29	TH29							
05	C		02	TH25	ADD	CD25	TH25							
06	C		02	TH21	ADD	CD21	TH21							
07	C		02	TH17	ADD	CD17	TH17							
08	C		02	TH13	ADD	CD13	TH13							
09	C		02	TH09	ADD	CD09	TH09	6	1					
10	C		02	TH37	ADD	CD37	TH37							
11	C	*												
12	C	*	07 IND SETOF SAL FOR HRLY RUN 08 IND SETOF HRLY FOR SAL RUN											
13	C			OUT	TAG									
14	C		07		SETOF							03		
15	C		08		SETOF							01		
	C													
	C													
	C													
	C													
	C													

Card Electro Number ______

REPORT PROGRAM GENERATOR CALCULATION SPECIFICATIONS

IBM System/360

Date ____________

Program ____________

Programmer ____________

Punching Instruction								
	Graphic							
	Punch							

Page 09 (1 2)

Program Identification (75 76 77 78 79 80)

Line (3 4 5)	Form Type (6)	Control Level (L0-L9, LR) (7 8)	Indicators: Not (9)	Indicators (10 11)	And: Not (12)	And (13 14)	And: Not (15)	And (16 17)	Factor 1 (18–27)	Operation (28–32)	Factor 2 (33–42)	Result Field (43–48)	Field Length (49–51)	Decimal Positions (52)	Half Adjust (H) (53)	Resulting Indicators: Plus / Compare: High 1>2 (54 55)	Minus / Low 1<2 (56 57)	Zero or Blank / Equal 1=2 (58 59)	Comments (60–74)
01	C	*																	
02	C	*	COMP FOR HRLY OR SAL EMP COMP FOR ACT OR INACT EMP																
03	C								EMM142	COMP	'H'					10	10	09	
04	C								EMM147	COMP	7						11		
05	C	*	TOTAL ERROR COND FOR END OF REPORT																
06	C		N	MR		01				ADD	1	ERR0	30					12	
07	C		N	MR		02				ADD	1	ERR1	30					13	
08	C	L1								COMP	7						11		
09	C	L1		MR	N	11				ADD	1	ERR2	30					14	
10	C	L1		MR		10				ADD	1	ERR3	30					15	
11	C	L1		MR		09				ADD	1	ERR4	30					16	
12	C																		
13	C																		
14	C																		
15	C																		
	C																		
	C																		
	C																		
	C																		
	C																		

Card Electro Number ____________

REPORT PROGRAM GENERATOR OUTPUT-FORMAT SPECIFICATIONS

IBM System/360

Date ______

Program ______

Programmer ______

Punching Instruction	Graphic							
	Punch							

Page (1 2) 10

Program Identification (75 76 77 78 79 80) ☐☐☐☐☐☐

Line (3 4 5)	Form Type (6)	Filename (7–14)	Type (H/D/T) (15)	Stacker Select (16)	Space Before (17)	Space After (18)	Skip Before (19 20)	Skip After (21 22)	Output Indicators Not (23 24 25)	And Not (26 27 28)	And Not (29 30 31)	Field Name (32–37)	Zero Suppress (Z) (38)	Blank After (B) (39)	End Position in Output Record (40–43)	Packed Field (P) (44)	Constant or Edit Word (45–70)	Sterling Sign Position (71–74)
0 1	O	PRINTOUT	H			1	01		1P									
0 2	O	O	R						OF									
0 3	O														23		'SHIFT NO 1'	
0 4	O														48		'SHIFT NO 2'	
0 5	O														73		'SHIFT NO 3'	
0 6	O														90		'OVER'	
0 7	O														100		'HOLIDAY'	
0 8	O											PAGE	Z		132			
0 9	O														129		'PAGE'	
1 0	O		H			1			1P									
1 1	O								OF									
1 2	O														15		'REG'	
1 3	O														25		'O/T'	
1 4	O														40		'REG'	
1 5	O														50		'O/T'	
	O																	
	O																	
	O																	
	O																	
	O																	

Card Electro Number ______

REPORT PROGRAM GENERATOR OUTPUT-FORMAT SPECIFICATIONS

IBM System/360

Date ____________

Program ____________

Programmer ____________

Punching Instruction								
	Graphic							
	Punch							

Page (1-2) 11

Program Identification (75-80) ____________

Line (3-5)	Form Type (6)	Filename (7-14)	Type (H/D/T) (15)	Stacker Select (16)	Space Before (17)	Space After (18)	Skip Before (19-20)	Skip After (21-22)	Output Indicators Not (23)	Output Indicators (24-25)	And Not (26)	And (27-28)	And Not (29)	And (30-31)	Field Name (32-37)	Zero Suppress (Z) (38)	Blank After (B) (39)	End Position in Output Record (40-43)	Packed Field (P) (44)	Constant or Edit Word (45-70)	Sterling Sign Position (71-74)
01	O																	65		'REG'	
02	O																	75		'O/T'	
03	O																	90		'SEAS'	
04	O		H			2				1P											
05	O	O	R							OF											
06	O																	6		'EMP NO'	
07	O														CD76			132		' 1 167'	
08	O																	15		'HRS'	
09	O																	25		'HRS'	
10	O																	40		'HRS'	
11	O																	50		'HRS'	
12	O																	65		'HRS'	
13	O																	75		'HRS'	
14	O																	90		'HRS'	
15	O																	100		'HRS'	
	O																				
	O																				
	O																				
	O																				
	O																				

Card Electro Number ____________

REPORT PROGRAM GENERATOR OUTPUT-FORMAT SPECIFICATIONS

IBM System/360

Date ____________

Program ____________

Programmer ____________

Punching Instruction									
Graphic									
Punch									

Page (1 2) 12

Program Identification (75 76 77 78 79 80) ☐☐☐☐☐☐

Line 3 4 5	Form Type 6	Filename 7–14	Type (H/D/T) 15	Stacker Select 16	Space Before 17	Space After 18	Skip Before 19 20	Skip After 21 22	Output Indicators Not 23	24 25	And Not 26	27 28	And Not 29	30 31	Field Name 32–37	Zero Suppress (Z) 38	Blank After (B) 39	End Position in Output Record 40–43	Packed Field (P) 44	Constant or Edit Word 45–70	Sterling Sign Position 71–74
0 1	O		D			1			N	MR		01		11							
0 2	O		OR			1			N	MR		03		11				132		'MASTER FILE ONLY ''	
0 3	O									01											
0 4	O														EMM340			91		' .0-'	
0 5	O														EMM421			76		' .0-'	
0 6	O														EMM419			66		' .0-'	
0 7	O														EMM417			51		' .0-'	
0 8	O														EMM415			41		' .0-'	
0 9	O														EMM346			26		' .0-'	
1 0	O														EMM343			16		' .0-'	
1 1	O														EMM002			6			
1 2	O									01								7		'*'	
1 3	O		D			1			N	MR		02									
1 4	O																	132		'DETAIL CARD ONLY ''	
1 5	O														CD37			101		' .0-'	
	O																				
	O																				
	O																				
	O																				
	O																				

Card Electro Number ____________

REPORT PROGRAM GENERATOR OUTPUT-FORMAT SPECIFICATIONS

IBM System/360

Date ____________

Program ____________

Programmer ____________

Punching Instruction	Graphic						
	Punch						

Page (1 2) 13

Program Identification (75 76 77 78 79 80)

Line (3 4 5)	Form Type (6)	Filename (7–14)	Type (H/D/T) (15)	Stacker Select (16)	Space Before (17)	Space After (18)	Skip Before (19 20)	Skip After (21 22)	Output Indicators Not (23)	Output Indicators (24 25)	And Not (26)	And (27 28)	And Not (29)	And (30 31)	Field Name (32–37)	Zero Suppress (Z) (38)	Blank After (B) (39)	End Position in Output Record (40–43)	Packed Field (P) (44)	Constant or Edit Word (45–70)	Sterling Sign Position (71–74)
01	O														CD33			91		' .0-'	
02	O														29			76		' .0-'	
03	O														25			66		' .0-'	
04	O														21			51		' .0-'	
05	O														17			41		' .0-'	
06	O														13			26		' .0-'	
07	O																	16		' .0-'	
08	O																	6		' .0-'	
09	O																	7		'*'	
10	O		T			1				L1		MR									
11	O									10		07						132		'HRLY DETAIL FOR SALY EMP'	
12	O									09		08						132		'SALY DETAIL FOR HRLY EMP'	
13	O								N	11								132		'DETAIL FOR INACT. EMP	
14	O														437		B	101		' .0-'	
15	O														433		B	91		' .0-'	
	O																				
	O																				
	O																				
	O																				
	O																				

Card Electro Number ____________

REPORT PROGRAM GENERATOR OUTPUT-FORMAT SPECIFICATIONS

IBM System/360

Date ____________

Program ____________

Programmer ____________

Punching Instruction	Graphic	
	Punch	

Page (1 2) 14

Program Identification (75 76 77 78 79 80) ____

Line (3 4 5)	Form Type (6)	Filename (7–14)	Type (H/D/T) (15)	Stacker Select (16)	Space Before (17)	Space After (18)	Skip Before (19 20)	Skip After (21 22)	Output Indicators (23 24 25)	And (26 27 28)	And (29 30 31)	Field Name (32–37)	Zero Suppress (Z) (38)	Blank After (B) (39)	End Position in Output Record (40–43)	Packed Field (P) (44)	Constant or Edit Word (45–70)	Sterling Sign Position (71–74)
01	O											H29		B	76		' .0-'	
02	O											H25		B	66		' .0-'	
03	O											H21		B	51		' .0-'	
04	O											H17		B	41		' .0-'	
05	O											H13		B	26		' .0-'	
06	O											H09		B	16		' .0-'	
07	O								N11						7		'	
08	O								09	08					7		'*'	
09	O								10	07					7		'*'	
10	O											CCD01			6		'*'	
11	O		T		1				LR									
12	O								N12						132		'MASTER FILE ONLY	
13	O								N12			ERR0	Z		106			
14	O											TH37			101		' .0-'	
15	O											TH33			91		' .0-'	
	O																	
	O																	
	O																	
	O																	
	O																	

Card Electro Number ____________

REPORT PROGRAM GENERATOR OUTPUT-FORMAT SPECIFICATIONS

IBM System/360

Date ____________

Program ____________

Programmer ____________

Punching Instruction	Graphic							
	Punch							

Page 15 (1 2)

Program Identification (75 76 77 78 79 80)

Line (3 4 5)	Form Type (6)	Filename (7–14)	Type (H/D/T) (15)	Stacker Select (16)	Space Before (17)	Space After (18)	Skip Before (19 20)	Skip After (21 22)	Output Indicators Not (23)	Output Indicators (24 25)	And Not (26)	And (27 28)	And Not (29)	And (30 31)	Field Name (32–37)	Zero Suppress (Z) (38)	Blank After (B) (39)	End Position in Output Record (40–43)	Packed Field (P) (44)	Constant or Edit Word (45–70)	Sterling Sign Position (71–74)
01	O														TH29			76		' .0-'	
02	O														TH25			66		' .0-'	
03	O														TH21			51		' .0-'	
04	O														TH17			41		' .0-'	
05	O														TH13			26		' .0-'	
06	O														TH09			16		' .0-'	
07	O		T		1					LR											
08	O								N	13								132		'DETAIL CARD ONLY '	
09	O								N	13					ERR1	Z		106			
10	O		T		1					LR											
11	O								N	14								132		'DETAIL FOR INACT EMP '	
12	O								N	14					ERR2	Z		106			
13	O		T		1					LR											
14	O								N	15								132		'HRLY DETAIL FOR SAL EMP '	
15	O								N	15					ERR3	Z		106			
	O		T		1			01		LR											
	O								N	16								132		'SAL DETAIL FOR HRLY EMP'	
	O								N	16					ERR4	Z		106			
	O																				
	O																				

Card Electro Number ____________

FORTRAN CODING FORM

		Punching Instructions	Page of
Program		Graphic ☐☐☐☐☐☐☐ Card Form # *	Identification
Programmer	Date	Punch ☐☐☐☐☐☐☐	73 80

C FOR COMMENT

STATEMENT NUMBER 1 5 | Cont. 6 | FORTRAN STATEMENT 7 10 15 20 25 30 35 40 45 50 55 60 65 70 72

```
    1 A=2.4+3.5
      TYPE 101, A,A,A,A
  101 FORMAT (111F6.3, 1F10.7, 1 F3.1, 1I4)
      I=2**5
      TYPE 102,I,I,I,I
  102 FORMAT (111 I2,1I4, 1I8, 1F612)
      Y= .43429448*LOGF ( 100.)
      TYPE 103,Y,Y,Y,Y
  103 FORMAT (11F10.7, 1F6.3, 1F13.7, 1I4)
      PAUSE
      GO TO 1
      END
```

FORTRAN CODING FORM

Program Volume of a Cylinder

Programmer

Date

Punching Instructions

Graphic

Punch

Card Form #

*

Page of

Identification

73 80

C FOR COMMENT

STATEMENT NUMBER 1 5 | Cont. 6 | FORTRAN STATEMENT 7 10 15 20 25 30 35 40 45 50 55 60 65 70 72

```
    1 TYPE 101
  101 FORMAT (111123HRAD1US   HEIGHT   VOLUME, 1)
    2 ACCEPT 102, R, H
  102 FORMAT (F4.1, 5X, F4.1)
      V=3.142*R**2*H
      TYPE 103, V
  103 FORMAT (17X9 F7.2)
      GO TO 2
      END
```

FORTRAN CODING FORM

		Punching Instructions		Page of
Program *Compute Vol. of a Sphere*		Graphic	Card Form # *	Identification 73 80
Programmer	Date	Punch		

C FOR COMMENT

STATEMENT NUMBER 1 5 | Cont. 6 | FORTRAN STATEMENT 7 10 15 20 25 30 35 40 45 50 55 60 65 70 72

```
    1 TYPE2
    2 FORMAT (11125HRADIUS   VOLUME OF SPHERE, 1)
    3 ACCEPT 4, RAD
    4 FORMAT (F5.1)
      VOL=4/3*3.14159*RAD**3
      TYPE 5, VOL
    5 FORMAT (11X F12.3, 1)
      PAUSE
      GO TO 3
      END
```

1514-9

FORTRAN CODING FORM

Program Evaluate Batting Averages

Programmer

Date

Punching Instructions

Graphic

Punch

Card Form #

*

Page of

Identification 73 80

C FOR COMMENT

STATEMENT NUMBER 1 5 | Cont. 6 | 7 10 15 20 25 30 35 40 45 50 55 60 65 70 72

FORTRAN STATEMENT

```
    1 TYPE 2
    2 FORMAT (1123HHITS  AT BATS
    3 ACCEPT 4, HITS, ATBAT
    4 FORMAT (F4.0, F5.0)
      AV6=HITS/ATBAT
      TYPE 5, AV6
    5 FORMAT (16X F6.4)
      GO TO 3
      END
```